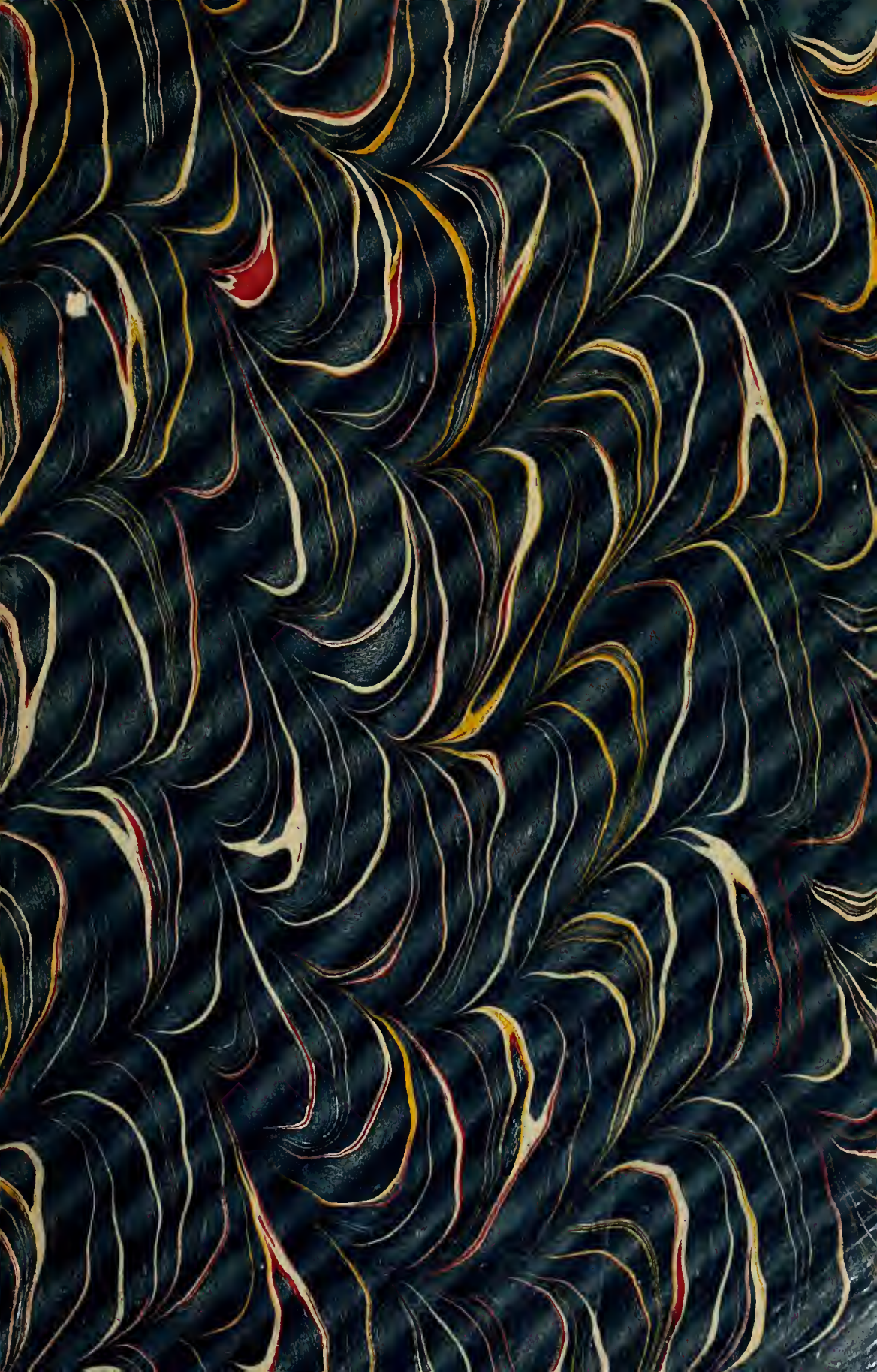


THE AMERICANA

A Universal Reference Library

Comprising the
Arts and Sciences,
Literature, History, Biography,
Geography, Commerce,
etc., of the world

EDITOR-IN-CHIEF

Frederick Converse Beach

EDITOR SCIENTIFIC AMERICAN

MANAGING EDITOR

George Edwin Rines

ASSISTED BY MORE THAN ONE THOUSAND
EMINENT SCHOLARS AND AUTHORITIES

Issued Under the Editorial Supervision
of The Scientific American

SIXTEEN VOLUMES

Scientific American
Compiling Department
258 & 260 Fifth Avenue
New York

A Few of the Leading Articles in Volume Fifteen

WRITTEN AND SIGNED BY SPECIALISTS

KEY TO PRONUNCIATION.

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

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

THE ENCYCLOPEDIA AMERICANA

Tate, tāt, **Alexander Norman,** English analytical chemist: b. Wells, Somerset, 24 Feb. 1837; d. Orton, Cheshire, 22 July 1892. He studied chemistry in Liverpool, where he established an analytical and consulting laboratory in 1863, and there became known to the world of industrial science in connection with the study of the recently introduced American petroleum. He wrote 'Petroleum and its Products' (1863), and superintended the erection and management of oil-refining works in the Isle of Man and in Flintshire until 1869. He finally settled at Hackins Hey and increased his reputation as an expert in the analyses of oils and fats, and as a teacher of science in the technical schools at Liverpool. He was editor of the scientific magazine 'Research' (1888–90) and a contributor to various scientific periodicals.

Tate, George, English archæologist and naturalist: b. Alnwick 1805, d. there 7 June 1871. He was a linen draper and subsequently postmaster of his native town, became celebrated for his scientific researches, and his publications, which include 'The Old Celtic Town of Greaves Ash'; the 'Hut-circles and Forts on Yevering Bell'; among the long list of valuable papers on the ancient remains of the district, its geology, flora and fauna, and 'Sculptured Rocks of Northumberland and Eastern Borders' (1865); and 'History of Alnwick' (1865–9).

Tate, Henry, English merchant and philanthropist: b. Chorley, Lancashire, 1819; d. Streatham 5 Dec. 1899. He was a sugar merchant in Liverpool and amassed a fortune through the invention of loaf sugar. He removed to London in 1880 and became famous for his benefactions, giving £42,000 to the Liverpool University College, a still larger sum to Liverpool hospitals, and four free libraries to the parish of Lambeth. He established a large private gallery of modern paintings at Streatham, and afterward presented it to the public, building for the collection a gallery near Vauxhall Bridge, at a cost of £80,000. The institution, known as the "Tate Gallery," was opened in 1897, and its donor was created baronet in 1898.

Tate, Nahum, English poet: b. Dublin about 1652; d. London 12 Aug. 1715. After receiving a classical education at Trinity College, he went to London, where he obtained the patronage of the Earl of Dorset. On the death of Shadwell, in 1692, Tate was appointed poet laureate to William III. This post he held through that and the succeeding reign; and he even lived long enough to write the first birthday ode on George I. He died in the Mint, whither he had retired from his creditors. He was the author of 'Brutus of Alba' (1678), a tragedy; 'Duke and no Duke' (1685), a farce; and some other dramatic pieces; a collaborator of Dryden in a second part of 'Absalom and Achitophel' (1682), of which all but 200 lines was written by him, and the author of an edition of 'King Lear,' which long kept the stage in place of the original; but it is by his metrical version of the Psalms of David (1696), executed in conjunction with Nicholas Brady, and commonly affixed to the liturgy of the Church of England, that he is now principally known.

Tatian, tā'shĭ-an, Christian apologist: b. 2d century in Assyria; d. Edessa 180. He studied Greek philosophy and became dissatisfied with the pagan systems of his time. At Rome about 150 he was converted to Christianity by the teachings of Justin Martyr (q.v.). His only surviving controversial work, 'Address to the Greeks,' was written 176, and after the death of Justin Martyr he adopted Gnostic Dualism and unchristian conceptions regarding God, the demiurge, and the world of æons, and admitted the existence of contradictions in the Scriptures. In practical matters he rejected the use of wine and of animal food, and used only water in celebrating the Eucharist. He was also opposed to marriage, and he gave in his adhesion to the sect of the Encratites. He was answered by Tertullian, Clement of Alexandria, Hippolytus, Origen, and others. His 'Diatessaron' was a kind of harmony of the four gospels. In 1876 Dr. Moesinger published at Venice a Latin translation of a commentary on the 'Diatessaron' which had been written by Ephraim Syrus. The translation had been made in 1841 by Aucher, a Mechitarist monk, not from the original Syriac of Ephraim, for that is not extant, but from

an Armenian version ascribed to the 5th century. In 1881 Zahn published his 'Tatian's Diatessaron,' in which he sought to restore the work from the available materials. An Arabic version found in Egypt was edited in 1888 by Agostino Ciasca. The original language of the 'Diatessaron' may have been Syriac; Harnack believes that it was Greek. Consult: Otto, 'Corpus Apologetarum' (1882); Hamphill, 'The Literature of the 2d Century' (1891); Harris, 'The Diatessaron of Tatian' (1890); Hill, 'The Earliest Life of Christ' (1893).

Tatius, tā'shĭ-ŭs, **Achilles.** See ACHILLES TATIUS.

Tatler, The, a paper published by Sir Richard Steele in London, from April 1709 to January 1711. The name, Steele asserted, was invented in honor of the fair sex, and he wrote in it under the pseudonym of "Isaac Bickerstaff," used by Swift previously in his joke upon the almanac-maker, Partridge. Its announcement indicated its purpose to present "accounts of gallantry, pleasure and entertainment," and it may be taken as the first venture in magazine literature in English. Steele wrote 188 of the 271 papers issued, Addison, 41, and together they produced most of the others. The 'Tatler' was succeeded by the 'Spectator' (q.v.).

Tattersall's, tăt'ĕr-sâlz, located in Knightsbridge Green, London, England, is the great metropolitan mart for horses, of which there is an auction every Monday throughout the year, and every Thursday in spring. It has acquired greater celebrity as the headquarters of betting men.

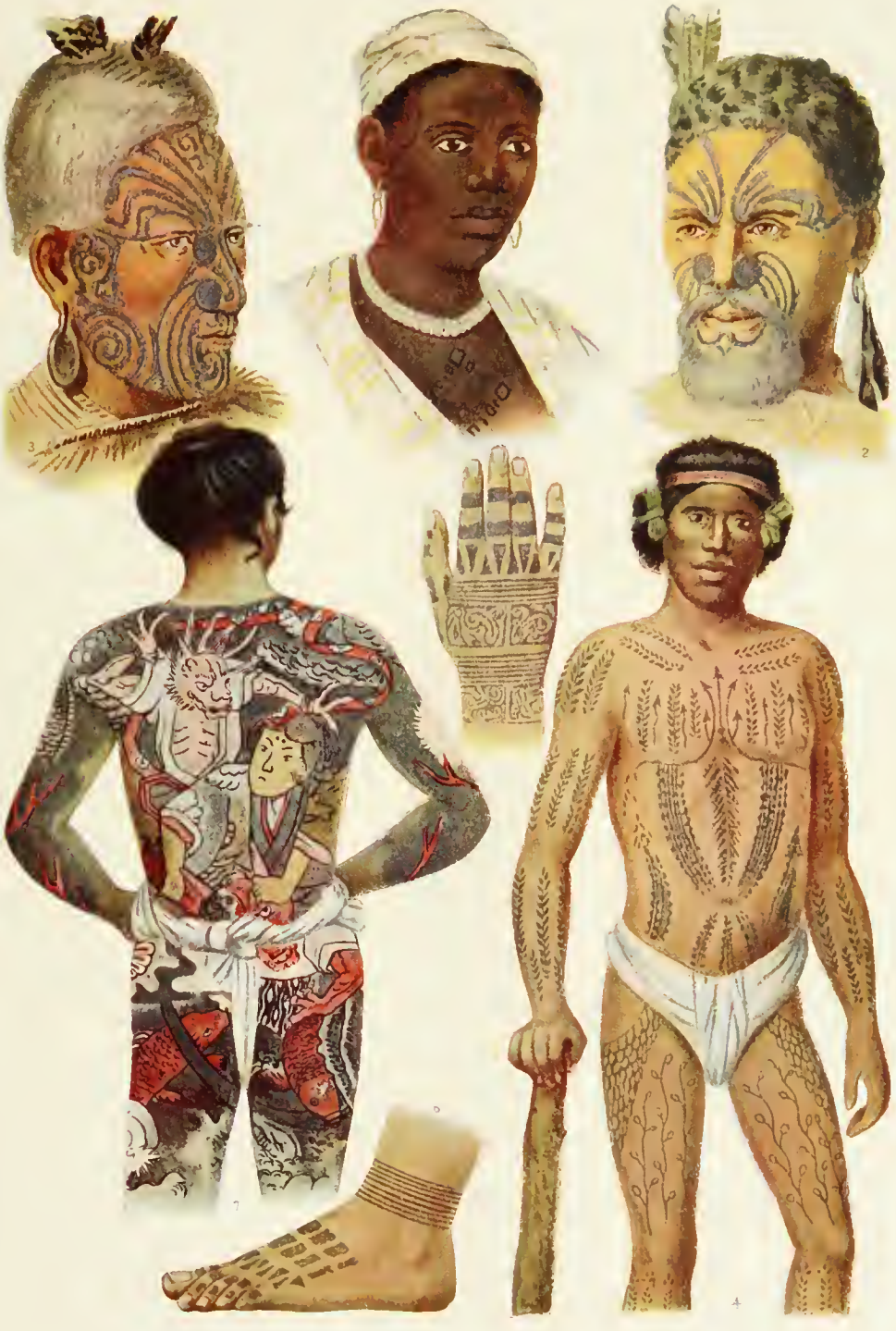
Tatti, tăt'tē, **Jacopo.** See SANSOVINO, JACOPO.

Tattnall, tăt'nal, **Josiah,** American naval officer: b. Bonaventure, near Savannah, Ga., 9 Nov. 1795; d. Savannah, Ga., 14 June 1871. He was educated in England and in 1811 returned to the United States, where the next year he was appointed midshipman in the navy. He was engaged in the battle of Bladensburg and served in the Algerine war in Decatur's squadron. He was promoted lieutenant in 1818, and was engaged in the suppression of the West Indian piracy under Porter in 1823–4. He was promoted commander in 1838, placed in charge of the Boston navy yard, and at the outbreak of the Mexican War was assigned to the command of the Spitfire, and joined the squadron at Vera Cruz. He took charge of the Mosquito division, with which he covered the landing of Gen. Scott's troops, and after the fall of Vera Cruz led the attack on the forts at Tuspan. He became captain in 1850 and in 1857 was appointed flag-officer of the Asiatic squadron, where he participated in an attack with the French and British on the Chinese. Although a violation of neutrality, he was sustained by public opinion and also by the government. In 1861 he resigned from the United States navy and offered his services to the governor of Georgia. He was appointed captain in the Confederate navy, took command of the Merrimac after the engagement with the Monitor in 1862 and set out for Hampton Roads. After the surrender of Norfolk and the navy yard he withdrew with the Merrimac, and on 11 May 1862 to prevent her capture sunk her off Craney Island. The court-martial, which he requested, after a thorough investigation, acquitted him from all blame. He then engaged in the defense of Savannah River but in 1865 was compelled to destroy his vessels. In 1870 he returned home and was appointed inspector of the port of Savannah, a post which he occupied until his death. Consult Charles C. Jones, 'Life of Commodore Tattnall' (1878).

Tattoo'ing, a word of Polynesian origin denoting the practice of making permanent colored designs or figures in the skin by means of small punctures or incisions, which receive various dyes or pigments. A similar custom, known as cicatrization or scar-tattooing, consists in repeatedly cutting the skin at the same place so that in healing a raised scar is left. Both varieties of tattooing may be found among the same people, as in the case of the natives of the South Sea Islands. Among the Admiralty Islanders, the Fijians, the Gonds and the Todas of India, the inhabitants of the Liu-Kiu Islands, and other races, color-tattooing is, or was, confined to the women, and the Latuka of the upper Nile Valley are an example of a people among whom scar-tattooing is practised upon women only. Color-tattooing is generally ornamental, but scar-tattooing is more frequently used to produce distinguishing tribal marks. The latter variety is practised by a number of native African peoples, while the Bangala of the Middle Kongo scar the whole body for ornamental purposes. In some races there is a connection between tattooing and marriage. Thus, in the Solomon Islands a girl is not eligible for marriage until she has been subjected to an atrociously cruel process of tattooing on the face and chest, and the native Australians inflict fearful scars on the backs of their young girls before marriage. The Formosans tattoo the faces of girls prior to marriage; and among the Papuans of New Guinea unmarried girls are tattooed all over, except on the face, which is adorned in this way at the time of their marriage. Color-tattooing of an ornamental kind reached its most artistic development among the Maoris of New Zealand and the Japanese, but both these peoples, like several others, have almost completely abandoned the practice under the influence of civilization. With the Malays tattooing appears to have been a reward of the successful headhunter. Sailors and some other classes still tattoo, especially on the arms, to some extent.

Tauchnitz, towh'nĭts, **Christian Bernhard,** FREIHERR VON, German publisher: b. Schleinitz, near Naumburg, 25 Aug. 1816; d. 13 Aug. 1895. In 1837 he founded his well-known publishing establishment in Leipsic; in 1860 was created a hereditary noble; in 1866 was appointed consul-general for Great Britain in the kingdom of Saxony; and in 1877 was made a life member of the Saxon first chamber. The firm is best known for its 'Collection of British and American Authors,' generally called the "Tauchnitz Edition," begun in 1841, and in 1903 extending to about 3,700 volumes.

Tauchnitz, Karl Christoph Traugott, German printer and bookseller: b. Grosspardau, near Grimma, 29 Oct. 1761; d. 14 Jan. 1834. In 1797 he set up a printing shop at Leipsic, which he enlarged by the addition of a book-shop in 1798 and a type-foundry in 1800, the style of



1. Sudanese Negro Woman. 2. 3. Maoris of New Zealand. 4. Caroline Islander. 5. 6. Hand nd Foot of a Dyak of Borneo. 7. Japanese.

the firm being Karl Tauchnitz. He first introduced stereotyping into Germany, and won a high reputation by his musical publications, his editions of the Bible and the Koran, and his remarkably correct series of Greek and Latin classics.

Tauler, tow'lĕr, **Johann,** German mystic: b. Strasburg about 1300; d. there 16 June 1361. At 18 he renounced a fortune to enter the Dominican cloister, where he studied the scholastic theology, and returning to Strasburg came under the influence of Master Eckhart, whose vernacular sermons then attracted thronging audiences. He was the more impelled to mystical and fervent piety by the violence of the war between Pope John XXII. and the Emperor Louis the Bavarian, when the bishop of Strasburg forbade the clergy to open their churches. He became one of the so-called "friends of God," an unorganized brotherhood, including priests, nobles, and burghers in all the large cities, who represented the height of mysticism, denied the special prerogative of the clergy except in the celebration of the sacraments, and with anti-sacerdotal tendencies dwelt upon worship in the heart and life. He preached with wonderful success in Strasburg, and in the neighboring towns, villages, and convents. Notwithstanding the papal interdict, and amid the ravages of the black death (1348–9), he bestowed the consolations of religion on the forsaken people, preaching in German mingled with Latin. He published in German a treatise on 'Following the Lowly Life of Christ'; addressed a remonstrance to the clergy against leaving the dying untended and unabsolved; and denounced ecclesiastical abuses while maintaining the claims of the electors. His mysticism, though it pronounced silence and suffering the most perfect work, was rather active than passive, taught explicitly the love of others, tended not to asceticism but to the amelioration of society, recommended the discharge of all ecclesiastical duties as a preparation for a higher stage of spiritual perfection, and was opposed to the pantheistic tenets of Eckhart and the Beguins. The best of the early editions of his sermons are those of 1498, 1521–2, 1523, and 1543. The hymns and treatise on German theology, which have been attributed to him, are of doubtful authenticity. Consult: Schmidt, 'Johannes Tauler von Strasburg' (1841); Winkworth, 'Life and Times of Tauler, with 25 of his sermons translated from the German' (1857); Junot, 'Les Amis de Dieu au XIVe Siècle' (1870).

Taunton, tân'ton, England, a market town of Somerset, on the Tone, 36 miles by rail south-southwest of Bristol. The principal buildings and institutions are the parish churches of Saint James and Saint Mary Magdalene; an old grammar-school, reconstructed; a Wesleyan Methodist and a Congregational College; a mechanics' institute; and the castle, still in good preservation, and containing the museum of the Somersetshire Archæological and Natural History Society. The industrial establishments include silk-factories, glove and paper-box works, iron and brass foundries, coach-works, breweries, etc. Taunton is of great antiquity, and from the discovery of urns containing Roman coins appears to have been a Roman station. During the civil war it was defended by the Parliamentarians against the Royalists. The inhabitants suffered much from the rebellion of Monmouth, whose cause they espoused, and who assumed the title of king here on 20 June 1685. Jeffrey (q.v.) held his bloody assize here in the same year. Pop. (1901) 21,078.

Taunton, tân-tŏn, Mass., city, county-seat of Bristol County; at the head of navigation on the Taunton River, and on the New York, New Haven & Hartford Railroad; about 36 miles southeast of Boston and 16 miles north of Fall River. Over 100 passenger trains and about 100 freight trains enter the city daily. The Fall River line of steamers, which have daily connection with New York and other places, are so easily reached that practically Taunton has daily communication by water with many of the Atlantic ports. The city gets its coal at tide water, and freight rates to and from Taunton are less than for inland cities. Electric lines connect the nearby villages and towns with the city.

The city is noted for the extent and variety of its manufacturing industries. The government census of 1900 gives the leading manufacturing establishments of the city as follows: seven cotton mills, with $4,410,390 invested, and employing 3,151 persons, to whom were paid annually $1,125,679. The cost of the material used annually was $2,651,502, and the value of the yearly products was $4,592,466. There were 14 foundries and machine shops, with capital invested, $2,679,203; the value of their yearly products, $2,636,390. The total number of manufactories (1900) was 284; the total capital invested, $11,737,399; the annual average number of employees, 7,702; the annual amount of wages, $3,331,680; the cost of material used, $5,993,237; and the value of the products, $12,594,814. The principal manufactures, besides cotton products, are cutlery, machinists' tools, shoe buttons and eyelets, tacks, nails, jewelry, machinery for cotton manufactories, silver and britannia ware, brick, oil-cloth, copper and yellow metal goods, printing presses, stoves, stove linings, and kitchen utensils. The city is the distributing centre for a large part of Bristol and adjoining counties; coal is shipped from here to the markets of the interior, and grain, vegetables, poultry, and manufactures to outside markets.

The principal public buildings are the State Insane Hospital, a massive group of buildings, situated in a tract of 140 acres, which accommodate over 1,000 patients; the county court-house (cost over $300,000); Registry building (cost $125,000); the government building ($100,000); city hall; Taunton jail; theatre; Odd Fellows' Hall; Historical Hall; Morton Hospital, the gift of Susan Tillinghast Morton Kimball; Old Ladies' Home, opened January 1871; club buildings, banks, business blocks, schools, and churches. There are six each of Congregational and Roman Catholic churches, four Methodist, one each of Unitarian, Baptist, Presbyterian, Christian Scientist, Adventist, Protestant Episcopal, and Universalist. The educational institutions are Bristol Academy, opened 18 July 1793; Saint Mary's Academy

(R. C.); headquarters of the Old Colony Historical Society, incorporated 4 May 1853; a high school, public and parish schools, graded elementary schools, and a public library containing about 45,000 volumes. The city is well supplied with bank institutions; the three national banks had, 1 Jan. 1904, a combined capital of $1,765,000; the combined surplus of two savings banks was $8,335,000; and three co-operative banks had a combined capital of over $3,000,000; also Taunton Safe Deposit and Trust Co., capital stock, $200,000. The government of the city is vested in a mayor, a board of eight aldermen, and a common council of 24 members; the mayor chosen by popular vote, the aldermen and council by wards.

History.—The first white settlement was made by Elizabeth Pole, an Englishwoman, in 1637. She found here an Indian village called Tecticutt ("great river") on the Tecticutt River. Miss Pole bought land from the Indians for a plantation on the east side of the river, within the present limits of Ward Four. The place was first called Cohannet, but when it was incorporated in 1639, it was called by its present name, after Taunton, England. In June 1639 Taunton sent deputies to the General Court assembled at Plymouth. The names which appear on the Taunton records,—of men connected with the surveys and the granting of titles—are names of men who were among the history makers of the nation. The early settlers of Taunton recognized the rights of the Indians, and the records show that Miss Pole and others purchased lands from Massasoit and other Indians. William Hooke, the first minister, returned to England as domestic chaplain to Oliver Cromwell. The first mention of a schoolmaster is that of Master Bishop, who was one of the early settlers. Other schoolmasters were William Pole, Mr. Adams, James Green, and in 1683, Samuel Danforth, a minister, was selected to keep a "Gramer scole here in Taunton." In 1647 an act was passed which made the public schools free and the support of the schools compulsory. In 1682 Taunton received from the Court three pounds from the funds of the fishing excise of the Cape, for keeping a free colonial, classical, and elementary school. In 1701–2 100 acres of land, on both sides of the river, were set apart for school purposes. The history of education in Taunton is an almost complete history of the city. A grist mill was erected in 1639–40; in 1653 the first successful iron works in America were established. Some of the products of the iron works were used as money, as may be seen from the following order:

To the Clerk of the Iron Works,
Ensign Thomas Leonard please pay to Bar' Tipping nine shillings and three pence in iron money.
From yr friend,
RICHARD WILLIAMS.

Taunton 16th 1st — 1685.

In 1659–60 a saw-mill was built, and before 1700 brick making, ship building, and many other industries had been begun. The ruins and sites of many of the old manufactories are pointed out as of historic interest; for they mark the beginnings of the mighty industries of the Taunton of the present. On 6 Nov. 1746 the place was made a "shire town," and on 2 Jan. 1865 was incorporated as a city. The first crucibles in America were made here; the copper blank disks for copper cents were supplied to the government, in large amounts, by the Taunton Manufacturing Company. Taunton has always furnished promptly more than its quota of soldiers when the country called for defenders. In 1774, the people unfurled from the liberty pole on "Taunton Green" a flag, on which was inscribed "Liberty and Union"; and among the "minnit men" at Lexington, 19 April 1775, was a brave band from Taunton. They were among the first to go and the last to return. Robert Treat Paine, one of the signers of the Declaration of Independence, resided here, for whom a statue is now being cast to be erected in front of City Hall. Consult: Waterman, 'History of Taunton Schools'; Emery, 'History of Taunton' (1893); 'Quarter-Millennial Celebration of the City of Taunton.' JAMES E. SEAVER,
Secretary Old Colony Historical Society.

Taunus, tow'noos, Germany, a mountain range mainly in the Prussian province of Hesse-Nassau, extending eastward from the Rhine, north of the Main, separating the basin of that river from that of the Lahn. The highest summit, Grosser Feldberg, is 2,886 feet in elevation. The district is well wooded, and exhibits much picturesque scenery, as well as ruined castles, etc., and antiquarian remains dating from Roman times. Its scenery and mineral waters attract many visitors; and some of the finest German wines are grown on the south side.

Taurida, tow'rē-dä, Russia, a southern government bounded north by Ekaterinoslav; east by the Sea of Azov; southeast, south, and west by the Black Sea; and northwest by the government of Kherson, from which it is separated by the Dnieper; area, 24,497 square miles. It is irregular in shape, and being united to the land only on its boundary with Ekaterinoslav for about 90 miles, may be regarded as one large peninsula, subdivided again into two minor peninsulas, of which that in the south, now called the Crimea, and well known in ancient times as the Chersonesus, is the more perfect; the isthmus which connects it with the northern portion being at its narrowest not more than eight miles. The northern peninsula consists almost entirely of an extensive steppe, which stretches across into the southern peninsula. It is generally without a tree, and in many parts composed of parched and saline sands, where vegetation is almost extinct; but in other parts is composed of fertile loams, capable of raising any kind of crop, and often covered with verdant pastures. Simferopol is the capital city. (See also the article CRIMEA.) Pop. (1897) 1,443,566.

Taurus, tâ'rŭs, Asiatic Turkey, a mountain chain usually considered as commencing in the east on the Euphrates, at the Nushar Cataract, in the pashalic of Marash, whence it stretches west, nearly parallel to the coast of the Mediterranean, for above 500 miles, terminating to the north of the Gulf of Adalia. In the east it takes the name of Jebel-Kurim, in the west that of Ramadan Oglou Balakar. It sends off several branches, of which the most remarkable are Alma-Dagh, which proceeds south into Syria, and becomes linked with the chain of Lebanon; and the Anti-Taurus, which proceeds northeast, sending out ramifications which be-

come linked with Ararat, Elburz, and Caucasus. Height over 10,000 feet.

Taurus, the Bull, in astronomy, a name given the second of the zodiacal constellations. It contains the star of the first magnitude Aldebaran (in the eye), the group of the Pleiades (in the neck), and the Hyades (in the face).

Taussig, tows'ĭg, **Edward David,** American naval officer: b. St. Louis, Mo., 20 Nov. 1847. On graduating from the United States Naval Academy in 1867, he was appointed successively ensign, master, and lieutenant, being made lieutenant-commander 19 June 1892. He has served on the European and Pacific stations and in the coast survey. He took possession of Wake Island for the United States and was placed in charge of Guam 1 Feb. 1899. He was on duty in the Philippines and during the summer of 1900 in North China. He has commanded the Bennington and the Yorktown.

Taussig, Frank William, American political economist: b. St. Louis, Mo., 28 Dec. 1859. He was graduated from Harvard in 1879, and has been full professor of political economy there since 1892. He has written 'Tariff History of the United States' (1888); 'Silver Situation in the United States' (1892); 'Wages and Capital' (1896); and has been editor-in-chief of 'The Quarterly Journal of Economics.'

Tautog', a marine fish (*Tautoga onitis*) of the Atlantic coast of the United States, related to the cunners and wrasses of the family *Labridæ,* and locally known as blackfish or oyster-fish. It is from two to three feet in length, when large, blackish or greenish in color, the young with about three pairs of obscure dark bars; chin white; eye greenish. It abounds about weedy rocks, oyster reefs, etc., near shore, feeding on mollusks, barnacles, etc., and is easily caught. It is one of the best table-fishes of the American coast.

Tavern, a name common in the rural districts of the United States for a village inn or hotel. A country tavern in this country is equivalent to the wayside inn in Great Britain. In cities taverns are invariably designated as hotels.

Tavernier, tä-vĕr-nē-ā, **Jean Baptiste,** Baron d'Aubonne, French traveler: b. Paris about 1605; d. Copenhagen 1689. Before his 21st year he had visited a considerable portion of Europe. He subsequently traveled through Turkey, Persia, and other Eastern countries, six times by different routes, trading as a diamond merchant, and studying manners and customs. Of his journeys he gave an account, with the assistance of a literary friend. In 1669, having realized a large fortune and obtained a patent of nobility, he retired to the estate of Aubonne, in the Genevese territories, with the view of passing there the remainder of his life. But altering his determination, he was preparing to start once more for the East, when he was suddenly overtaken by death. His travels, 'Voyages en Turquie, en Perse, et aux Indes,' of which there are translations in English (1678 and 1684), Dutch (1682), and German (1684), have gone through several editions in the original French.

Tavoy, tä-voi', Burma, (1) A town in Tenasserim, on the river of the same name, capital of a district, 35 miles from its mouth, 230 miles southeast of Rangoon. It lies in a low situation, which, during the rainy season, becomes almost a swamp. It is laid out in straight streets, and the houses are mostly built of timber and thatched with palm leaves. The trade is inconsiderable. Near the town a mass of native loadstone occurs, and at a short distance from it is a hill entirely composed of specular iron ore. Pop. 15,000. (2) An executive district with an area of 5,308 square miles; pop. (1901) 109,131. (3) An island, the largest and most northern of the extensive chain which is called the Mergui or Tenasserim Archipelago. It is about 18 miles long and two broad, and its southern part is surrounded by numerous shoals and small islands, which make navigation dangerous. On the eastern side there is a good and well-sheltered harbor, which has received the name of Port Owen.

Tawas (tâ'wăs) **City,** Mich., village, county-seat of Iosco County; on Tawas Bay (an inlet of Lake Huron), at the mouth of the Tawas River, and on the Detroit & Mackinac Railroad; about 66 miles north of Bay City. It has a good harbor and steamer connection with many of the lake ports. It is in an agricultural and lumbering region, and nearby are large salt deposits. Its industries are connected chiefly with the manufacturing of lumber, and the shipment of salt, lumber, and farm products. There is one bank. Pop. (1890) 1,544; (1900) 1,228.

Tawi Tawi, tä'wĕ tä'wĕ, Philippines, (1) A group of islands of the Sulu Archipelago, forming the extreme southwestern part of the Philippines, consisting of 88 islands; area, 462 square miles. Some of the islands, though charted, are unnamed; the others are divided into three sub-groups or clusters: (*a*) the Cinapusan or Kinapusan cluster; (*b*) the Tawi Tawi cluster; and (*c*) the Laparan cluster. The larger islands are mountainous, but of moderate height; the valleys and plains are fertile, and covered with tropical vegetation. Rice, corn, hemp, and coffee are cultivated, but only for domestic use; the forest wealth is considerable, but is not of commercial value on account of lack of means of transportation. The chief industry is fishing, pearl fishing, and gathering of mother-of-pearl, etc. The islands are sparsely populated, and as many are very inaccessible, have been for many years the hiding places of pirates; the few settlements were mostly established by the Spaniards. Pop. 1,815 fighting men.

(2) The largest and name island of the Tawi Tawi group; length from northeast to southwest, 35 miles; greatest width, 15 miles; area, 187 square miles. It is mountainous, and of volcanic formation; they are three groups of two peaks each, one at the southern end, one at the northern end, and the third in the east central part; greatest elevation, 1,941 feet. The soil is generally fertile, and the island well wooded; the chief industry, as in the rest of the group, is fishing. The chief settlement is Tatán, on the northwest coast, on a small bay.

Tax Assessors. See Taxation.

Taxation. A tax is an enforced contribution levied on persons, property, or income, by the authority of government for the support of government. Taxation is the act of raising

public revenue in the form of taxes. While taxation in one form or another is doubtless as old as government itself, the comprehensive, orderly, revenue systems which prevail in civilized countries to-day are distinctly modern in their origin. In early times a contribution for the support of government was regarded as a gift (*donum*); later it was considered as a favor or assistance (*adjutorium*); still later a tax came to be called by a name which implied the feeling of obligation (duty); finally the volition of the taxpayer is entirely disregarded and taxation becomes a matter of compulsion and the citizen pays a tax, a sum estimated (*taxare*, to estimate) by the sovereign power of the State.

The Source of the Taxing Power.— The taxing power is one by virtue of which government determines the amount which a citizen shall pay into the public treasury and enforces payment if necessary. It is therefore a sovereign power. "The power to tax is the power to destroy and the power to keep alive." Where shall this power reside? In the long battle for human rights this was always a foremost question. The conflict between John of England and his barons arose from the fact that the king had been arbitrarily taking sums of money from his subjects, and one of the most important clauses in Magna Charta (1215) was a promise that in the future no contributions (aids) to the public treasury should be made except by the consent of the general council of the realm. The struggle between Charles I. and his people (1649) also hinged upon the question whether or not the king could legally take money from subjects without the consent of Parliament. Events decided that he could not. A similar question gave rise to the American Revolution and the outcome of that contest confirmed the principle that in America taxes cannot be levied without either the personal consent of the people or the consent of their representatives. In this principle lies the cardinal fact of taxation; in all countries where civil liberty is enjoyed the taxing power resides in the legislature. In the United States the power to tax flows from two sovereign sources, from Congress acting under the authority of the Federal Constitution, and from the State legislature acting under the State Constitution. The framers of the Federal Constitution, recognizing that revenue is the life-blood of government, gave to Congress an almost unlimited power to tax, and at the same time reserved for the States the privilege of raising their own revenue in their own way. Taxation in the United States, therefore, is a concurrent power exercised with equal vigor by the State and by the Nation. The powers of Congress in reference to taxation are expressed in Article I. of the Constitution (sections 8, 9, and 10). Congress is restricted in its taxing power in only three particulars: (1) duties and excises must be uniform throughout the United States so that one region may not be benefited at the expense of another; (2) direct and capitation taxes must be apportioned to the States according to population; (3) duties cannot be laid on articles exported from any State. Aside from these restrictions Congress can levy any kind of tax whatsoever and for any amount desired. The power of the State to tax is but slightly abridged by the Federal Constitution. The State cannot tax exports or imports; it cannot, without the consent of Congress, lay any tonnage duty, that is, any tax on the carrying capacity of a vessel or vehicle of transportation passing through, from, or to a State or foreign country; it cannot tax the agencies by means of which the Federal government is enabled to exercise its functions; for example, it cannot tax the bonds of the Federal government or its public buildings or the money in its mints. With these restrictions the power of the State to tax all taxable objects within its boundaries is virtually supreme. This power, however, is exercised by the State legislature, municipalities, and minor civil divisions, subject to the restriction of the State Constitution, and in nearly all instances these bodies find that wholesome limitations have been placed upon their authority to tax.

Different Kinds of Taxes and Classification.— It is the purpose of the legislator when levying taxes to bring all kinds of property, tangible and intangible, within the scope of the levy. For the sake of system he divides the objects of taxation into classes, and gives to the tax levied on each class its appropriate name. The most important kinds of taxes which it is customary to collect and which yield practically all of the public revenue are here enumerated: The general property tax, levied (*a*) on real property which includes lands and buildings and other things erected on land, and (*b*) personal property, which may include such things as household furniture, money, goods, bonds, notes of promise, stocks, mortgages, jewelry, horses, carriages, farming implements. Customs duties are levied upon goods imported from foreign countries. Excises or internal revenue taxes are levied upon domestic manufactures, principally upon distilled spirits, beer, ale, tobacco, and oleomargarine. The income tax is levied upon the clear annual income of a person. The income may arise from profits upon business, from interest received upon money loaned, or from wages or salary. The corporation tax is levied upon private corporations (q.v.). This tax may take the form of an income tax, or it may be levied upon the bonds and stock of the corporation or upon the earnings. The inheritance tax is levied upon property received through inheritance or by will. This is sometimes regarded as an income tax on the ground that an inheritance or a legacy is simply an addition to one's income for the year. The franchise tax is levied upon a privilege granted by government. Thus if a city council grants to a corporation the right to operate a trolley line upon a certain street this right is a franchise. Franchises are not material, visible property, but they are property nevertheless, and they are sometimes extremely valuable. For example, the rolling stock, rails, wires and power houses of a trolley company may be worth only a million dollars, while the right to use the street would not be sold for three millions of dollars. The franchise tax is laid upon the value of this right. In addition to the franchise tax a corporation or property tax may be laid upon the material possessions of the company. License taxes resemble the franchise tax. They are collected from merchants, peddlers, hack-drivers, showmen, saloon-keepers and others for the privilege of transacting business. Fees and special assessments (not

always regarded as taxes) are collected as a partial payment for services rendered by the government. The charges for recording a deed or mortgage or for issuing a passport into a foreign country are examples of fees. A charge made for connecting a private drain with a public sewer is an example of a special assessment. The poll or capitation tax is a tax on the person as a person rather than as a possessor of property. A useful distinction is made between direct and indirect taxation. Direct taxes are those that are levied upon "the very person who it is supposed as a general thing will bear their burden." The general property tax, the income tax, the poll tax, may be classed as direct taxes for the reason that when a person pays one of these taxes he is likely to bear the burden himself and is not likely to shift it to another. Indirect taxes are those that are collected from one person and then transferred in whole or in part by that person to another. The customs duties, the internal revenue tax, and many fees and licenses are to be classed with indirect taxes. The distinction between direct and indirect taxation is made clear by considering the manner in which the tax is levied. "Direct taxes are those levied on permanent and recurring occasions and are assessed according to some list or roll of persons. The taxpayer is regarded as definitely and permanently ascript to the treasury. Indirect taxes on the other hand are levied according to a tariff on the occurrence of transactions and events which are not previously ascertainable as regards particular persons. The amount of a direct tax assessed in this way is certain and regular, while an indirect tax is uncertain and irregular, as regards individuals." (Nicholson.) Decisions of the Supreme Court have determined what kind of taxes may be regarded as direct within the meaning of the Constitution and these are the capitation or poll tax and the tax on lands. The inheritance tax under the court's ruling is an excise. In 1894 Congress passed a law levying a tax on incomes, but the Supreme Court of the United States declared the income tax to be a direct tax and pronounced the law unconstitutional because the tax levied was not apportioned among the States according to population. This decision has the practical effect of restricting the Federal government to indirect taxes (customs and excises) as the main source of revenue. A just and equitable direct tax cannot at present be levied by the Federal government.

The Principles of Taxation.— These may be stated as follows: 1. (Equality) Citizens should contribute toward the support of government as nearly as possible in proportion to their respective ability. 2. (Certainty) The tax which each individual is bound to pay ought to be certain and not arbitrary. The time of payment, the manner of payment, the quantity to be paid ought all to be clear and plain to the contributor and to every other person. 3. (Convenience) Every tax ought to be levied at the time or in the manner in which it is most likely to be convenient to the contributor to pay it. 4. (Economy of Collection) Every tax ought to be so contrived as both 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. 5. (Elasticity) "A good system of taxation ought to provide for a self-acting increase in the revenue in proportion as wealth and population and the consequent demands of governmental expenditures increase." 6. (Probable Productiveness) "Those taxes are best which yield a steady calculable return." By observing this rule normal expenditures may be adjusted to normal revenue. 7. (Incidence) That tax is best whose incidence can be foreseen by the legislator. A tax is often shifted from one person to another until it falls upon a person who cannot shift it. For example, where mortgages are taxed the mortgagee may increase the rate of interest and thus compel the mortgagor to pay the tax. If the mortgagor should lease the mortgaged property to a tenant he may in turn be able to shift the tax and cause it to fall upon the lessee in the form of a higher rent. Thus, in this illustration, whether the incidence be upon the mortgagor or upon his tenant, it will not be where the lawmaker intended it should be — upon the mortgagee. One of the most difficult tasks of the lawmaker is to determine upon whom the burden of a tax will ultimately fall. Most of the above rules were formulated by Adam Smith (1776). They have acquired almost universal authority, although legislators sometimes ignore them and, in accordance with the policy of Colbert, follow the rule of expediency and "so pluck the goose (the people) as to produce the largest amount of feathers with the least possible amount of squawking."

Federal Taxation.— By reason of the dual system of our government, taxation in the United States is resolved into two sharply defined systems, national taxation and state taxation. The story of national taxation begins with the estimates of expenditures which the secretary of the treasury presents to Congress in his annual report. These estimates are prepared by the heads of the several departments, each department stating the amount of money it thinks it will need during the coming fiscal year. Congress takes the estimates and accepts some of them, modifies some of them, and rejects some of them. When providing for the expenses of government Congress is entirely independent of the executive department. Not a dollar can be raised without its consent. When the appropriation bills have received the signature of the President and have become laws the first step in national finance has been taken. The second step is taken when Congress lays a tax for raising the money which it has decided to spend. Private individuals first estimate their income and then decide upon their expenditures; governments estimate their expenditures first and attend to the matter of income afterward. Bills for raising national revenue must originate in the House of Representatives, although they may be modified to almost any extent in the Senate. The committee on ways and means in the House has exclusive control of bills for raising revenue, a circumstance which makes it the most important committee in Congress. Although Congress has all kinds of taxes at its disposal, yet at the foundation of government it adopted the policy of raising revenue by indirect taxation and only in times of war has it departed from the original plan. The First Congress (1789) established a tariff regulating duties on imports, and all succeeding Congresses have followed its example. Considerably more than half the national revenue is derived from customs duties, and of the taxes raised from

this source more than half are collected at the port of New York. Several hundred articles are subject to the customs tax, but a few leading articles yield substantially the whole of this portion of the national revenue. The largest tariff revenues are collected from the manufactures of wool, cotton, silk, iron, copper, and tin, and from sugar, fruits, liquors, wines, cigars, drugs, and chemicals. Coffee, tea, books over 20 years old intended for public libraries, dyewoods, and fertilizers are admitted free of duty. Nearly all of the national revenue that is not raised by duties on foreign goods is derived from excises, that is, from taxes on articles produced in the United States. In the early years of our history domestic or internal taxes were unpopular and sparingly levied. During the War of 1812 taxes were imposed on a few domestic products, but these were abandoned soon after the war ended. For more than 40 years the only taxes imposed by the Federal government were customs duties. At the outbreak of the Civil War internal taxes became necessary and almost every article that can be taxed was subjected to the excise. When the war was over and there was no longer a necessity for such large revenues the oppressive features of the tax were removed. The articles now subject to the excise are alcoholic liquors, tobacco, cigars, cigarettes, snuff, oleomargarine, and playing cards. Customs taxes are collected at all the principal seaports by United States treasury officers known as collectors of customs. Imported goods are held in the custom houses until the duty is paid. There are 120 ports of entry where customs are collected. Excises are collected by districts. In each district there is a Federal collector of internal revenue. This officer has a corps of assistants called deputies who visit distilleries and breweries and cigar and tobacco manufactories for the purpose of bringing all taxable goods under the workings of the law. By confining itself to indirect taxation the Federal government is enabled to collect its revenue at the least possible expense. The cost of collecting the customs is about 3 per cent of the amount collected, while the internal revenue is collected at even less cost. The manner of collecting an indirect tax is acceptable to the people. Federal taxes are paid in factories and custom houses and the collectors do not attract the attention of the public. If Federal tax gatherers should come directly to individuals and demand the taxes they would often be most unwelcome visitors. Forty dollars a year — the amount per voter (approximately) that is required to support the Federal government — would seem to a man in Texas or in Maine to be a very heavy tax for the support of the government at Washington and the direct collection of it might not always be an easy matter. Expediency urges the continuance of the system of raising Federal revenue by the indirect method.

Taxation in the State.— State revenues are usually direct and are derived very largely from the general property tax. The rule that is supposed to be followed in levying this tax is this: The property of every person ought to contribute in proportion to its value. The rule implies that all the property of every person should be discovered by a tax official and that a fair valuation should be placed upon all the property of every person. All property, real or personal, within the boundaries of the State is subject to the taxing power of the State. Personal property within a State may be taxed by the State although the owner resides elsewhere, and although he pays taxes on the same property in the State or country in which he lives. This rule unavoidably leads to double taxation on certain classes of personal property. The first step taken in raising the general property tax is to place a just valuation upon all property, real and personal. This is done by assessors, local officers elected or appointed for the special work. The good or evil of the tax system of a State may be measured by the skill and honesty of those officers. The assessors of a local government, of a city, for example (a town or township would serve the purpose of illustration equally well) after careful inspection and inquiry estimate the value of the property, of every person who owns property within the city. The total valuation of all taxable property within the city is the assessment. With the assessment known and the expenditures determined upon, the city tax rate is found by dividing the expenditures by the assessment, the quotient being the rate. But the city most probably is located within a county (all cities in the United States, excepting Washington, Baltimore, and St. Louis, are located in counties) and there are county expenses to be met. County assessors estimate the value of property within the county outside of the city, and this assessment plus the city assessment gives the county assessment. The city must bear its share of county expenses and this will increase the rate of the city taxpayer. Further, the county as a part of the State must contribute its share to the support of the general State government. The State assessment is found by adding together all the county assessments. Divide the State assessment by the State expenditures and the quotient gives the State rate. In several States there is no general property tax levied for the support of the general State government, revenue for this purpose being received from other sources, principally from corporation taxes. The State rate is added to the local rates, making the tax rate of the city taxpayer the sum of three rates, the city rate, the county rate, and the State rate. In levying the general property tax everything depends upon the justice of the individual assessments. If the assessor place a value of $2,000 on A's house when it is worth $3,000 and a value of $4,000 on B's house when it is worth $3,000, B's tax bill will be twice as great as A's when in justice it ought to be the same as A's. To correct unfair assessments there is usually a board of equalization, or an appeal court, before which taxpayers may appear and protest when they think their property has been assessed too high. When the board is convinced that such complaints are reasonable a new and more just assessment is made. Sometimes the local assessors place the value of all property too low. If the undervaluation is uniform no harm is done as far as the locality itself is concerned, for while a low assessment means a higher rate the tax bill remains the same. Yet when the local government comes to contribute to the State government, if its property is assessed at less than its value while the property of its neighbor is assessed at its true value, it will contribute less than its just share. To remedy evils that arise from uneven assessments among locali-

ties, State boards of equalization have been established in about two thirds of the States, but very often the efforts of these bodies have not met with success. It is exceedingly difficult to overcome the wrongs of an unjust local assessment. After assessment and equalization comes collection. Tax collectors are usually appointed by local authority, although they are sometimes elected. These officers are guided entirely by the tax list made out by the officers of assessment. When property is delinquent, it may be seized and sold to satisfy the debt. If it sells for more than the amount of the tax the excess is returned to the owner. Usually the State, county and local taxes are collected at the same time and then distributed, the State treasury and the county treasury receiving their respective shares. Public policy demands that certain kinds of property should not be taxed. It is customary to exempt places of religious worship, places of burial not held for profit, and charitable and benevolent institutions. Household furniture to the value of $100 or $200 is sometimes exempt and in a few States exemption on property to the amount of $1,000 is allowed to soldiers who fought on the Union side in the Civil War. Public property of all kinds is always exempt. The constitution always specifies the classes of property that shall not be taxed and forbids the legislature to give exemption to any other class. In addition to the general property tax several other kinds of taxes contribute to the revenue of the State and of the minor civil divisions. Licenses of various kinds yield a considerable sum. In many States franchises are taxed at their salable value. The corporation tax is quite generally levied, but the method of levying it is by no means the same in all States. The tendency is to place the taxation of corporations under the control of State tax officials, local officers having failed to deal successfully with the subject. Sometimes corporations are taxed upon their gross receipts, or in the case of railroads, upon their mileage or upon the market value of their joint stock. These methods are being gradually abandoned and corporations are being assessed upon the actual value of their property within the State and upon the value of their franchises. New York, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, Missouri, have adopted this plan. Direct inheritances are taxed in seven States; collateral inheritance in 20; incomes in four. A poll or capitation tax ranging from $1 to $4 is sometimes levied. Fees sometimes go into the public treasury, sometimes they are paid to the officer who performs the services for which they are charged. Tolls collected for the use of roads and bridges owned by the government, water rents paid for the use of water supplied by the municipality, and special assessments for improvements are sources of considerable revenue, although, strictly speaking, they are not taxes.

Reforms in Taxation.— It is freely admitted that our taxing system abounds in imperfections. Some kinds of taxable property escape their burdens entirely; some kinds bear more than their just share; jurisdictions overlap and double taxation ensues; the owners of small fortunes often contribute to the public revenue at a rate that is ruinous; owners of large fortunes often contribute but little. To simplify the system and to remedy injustice and confusion and inequality, statesmen and publicists have proposed various plans of reform. As a complete remedy for all inequality and injustice in fiscal matters and as a cure for many social ailments it has been proposed to raise all revenue, Federal, State, and local, by a single tax imposed on land. To make the sacrifice experienced by the poor taxpayer equal to that experienced by the rich taxpayer a graduated or progressive tax has been proposed. Under the working of the progressive tax property would contribute somewhat according to a geometrical progression instead of contributing according to an arithmetical progression as it does in almost all cases at present. Thus if property (or income) valued at $10,000 should be taxed at a rate of 1 per cent, property valued at $20,000 at 2 per cent, property valued at $30,000 at 3 per cent, and so on, the rate increasing as the amount increases, the taxation would be progressive. A hint for progressive taxation was given by Adam Smith when he said: "It is not very unreasonable that the rich should contribute to the public expense not only in proportion to their revenue, but something more than in proportion." The argument for the progressive tax is wrapped up in the assertion that a tax is burdensome not in proportion to what is given, but to what is left. The argument against it is to be found in the contention that a progressive rate would stifle the incentive to accumulate and thus put a premium upon prodigality and unthriftiness.

Progressive taxation is not altogether a theory. In some of the cantons of Switzerland it is fully recognized as a feature of public finance. In England and in some of the countries on the Continent a progressive tax is levied on inheritances. During the Spanish-American War (1898) Congress levied a progressive inheritance tax. Several States have tax laws with progressive features and one (North Carolina) has a progressive income tax. The Supreme Court of the United States has sustained the validity of the progressive principle. Another scheme of reform involves a radical modification of the general property tax. This tax as administered in many States no longer gives satisfaction. As far as real property is concerned, lands, houses, and those physical objects that are immovable and clearly visible, there is little complaint. The trouble lies with personal property. It seems that the assessors can reach but a small part of the vast wealth that is embodied in stocks, bonds, notes, mortgages, and other easily concealable forms of personal property. Laws have tried to reach these forms of wealth by giving the assessor power to ask taxpayers the most searching questions in reference to their property and to require them to reply upon oath, but notwithstanding this, just assessments cannot be made. After the tax officers have done their best the largest part of personal property must be assessed by the owners themselves if it is assessed at all, and experience has taught that but few men will do this honestly. Those who do give the assessor a full and fair account of all their personal property are regarded as good-natured oddities. This failure to assess all the forms of personal property is made more regrettable from the fact that many forms may easily be reached and taxed. The personal property of the farmer, his horses, cattle, implements, and crops cannot escape the assessor's eye, and far-

mers for this reason must bear more than their share of taxes. "Personal property," says Seligman, "nowhere bears its just proportion of the burdens; and it is precisely in those localities, that is, the large cities, where its extent and importance are the greatest that its assessment is the least. The taxation of personal property is in inverse ratio to its quantity; the more it increases the less it pays." As a reform it is proposed that personal property be dropped from the assessment rolls and that the personal property tax be abolished and other forms of taxation be substituted therefor. By the confession of all this is a sweeping proposition and one that public opinion would be slow to support, yet it is also quite generally confessed that the personal property tax has failed and is failing so utterly that it no longer has a place in a scientific system of taxation. Still another reform seeks to prevent the overlapping of jurisdictions and the consequent injustice of double taxation by a scientific segregation of taxes: the several grades of government are to be separated for the purpose of taxation and to each grade is to be assigned the taxes which are peculiarly its own. Several schemes of segregation have been suggested, the most noteworthy being that proposed by H. C. Adams, whose scheme is as follows: to townships and counties, the taxes on real estate; to municipalities, taxes on incomes for services (salaries and wages), taxes on real estate, licenses, and franchise taxes; to the general State government, taxes on incomes derived from property and corporation taxes; to the Federal government, customs, and excise duties. That the need for reform in our tax laws is urgent cannot be denied, and it is probable that improvements in them will gradually be effected. Forty-five States are working, each in its own way, on the problems of taxation, and their experience is constantly teaching valuable lessons. There are two evils, however, which no system of finance is likely to overcome, be it ever so cunningly devised. These evils are an extravagant and unnecessary expenditure of the public money and systematic evasion of honest assessment. The permanent cure for these evils must be sought not in legislation, but in the operation of those moral forces that constrain men to right conduct. See BANKS AND BANKING; DEBT; FINANCE; SINGLE TAX.

Bibliography.— Adams, 'Finance' (1898); Plahn, 'Public Finance' (1896); Daniels, 'Elements of Public Finance' (1899); Cossa, 'Taxation, its Principles and Methods' (1893); Ely, 'Taxation in American States and Cities' (1888); Seligman, 'Essay in Taxation' (1900), also 'Progressive Taxation' (1894); Walker, 'Double Taxation in the United States' (Columbia University Studies, Vol. V., 1896); Wells, 'Theory and Practice of Taxation' (1900); Judson, 'The Taxing Power, State and Federal' (1902); a valuable treatise on the legal side of the question.

S. E. FORMAN,
Author 'First Lessons in Civics.'

Taxidermy is at once the most vexatious and most difficult of all the arts. It is no longer a question of filling out a skin, but rather of making a statue of a creature long since dead, which will exactly fit the skin of that particular creature, stand erect and pose as the counterpart of life. "Taxidermy, the handmaid of zoology," said Dr. J. A. Allen, "has already become one of the fine arts, requiring the skill and other qualities of both the sculptor and the painter, and capable of yielding results comparable with the masterpieces of either." It is, however, one of the newest of the arts, and there is serious need of a well established school of taxidermy in connection with some one of our great museums. Prior to 1880, only one American museum (the National) maintained a corps of taxidermists, and the majority of the mounted birds and mammals which found their way into other American museums were mounted at Ward's Natural Science Establishment, by men from France and Germany. Methods were crude, and results were far below the standards attained a few years later. Much of the work produced prior to 1880 has since been either dismounted, and remounted, or else destroyed.

In March 1880, at Ward's establishment in Rochester, N. Y., Messrs. Hornaday, Webster, Lucas, Martens, Bailly, Critchley, and Fraine organized the National Society of American Taxidermists, and seriously began the task of developing taxidermy up to the level of the fine arts. All jealousy and exclusiveness were swept aside, and the three competitive exhibitions that were held in Rochester, Boston, and New York, finally opened the eyes of scientific men and of the general public, also, to the possibilities of scholarly taxidermy, when properly encouraged and paid for. The upward impetus then gained has already carried American taxidermy beyond the original hopes of the founders of the society, and the museums of America are now being filled with mounted vertebrates that in large measure are not only of real educational value, but are also agreeable to the eye. No modern American museum is now complete without a well-equipped department of taxidermy, in charge of a chief taxidermist on a salary, which in 1880 would have been considered unattainable.

In a modern, high-class taxidermist, the first requisite is not a knowledge of methods in mounting, but the thorough education of the eye in animal forms and expressions. This must be secured by courses in drawing, modeling, carving, and painting. The skeletons and external muscles of animals must be well studied, the latter from life. Besides the making of numberless sketches from life, hundreds of live-animal photographs should be collected and arranged for reference. Casts of heads and special parts of dead animals are of great importance, and should be diligently collected. At all times must the natural history of the vertebrates be studied and kept in mind. When this preparatory work has been accomplished, the aspirant for taxidermic honors must secure admission to the laboratory of some master-taxidermist, and work with him to acquire a knowledge of methods.

A comparison of American with European taxidermy is of but passing interest, chiefly for the reason that without an international exhibition it is impossible to draw parallels of positive value. From three inspections of European zoological museums, made in 1876, 1896, and 1902, it is the opinion of the writer that the best of our museum taxidermy is now decidedly in advance of the best to be found in Europe. The groups of mammals, great and small, that now are so intensely interesting to

visitors in the museums of Washington, New York, Pittsburg, Chicago, Milwaukee, and at the University of Kansas, have no counterparts in Europe. The British Museum of Natural History, at South Kensington, contains a fine series of groups of birds, mounted with natural accessories. In the museum of the Amsterdam "Natura Artis Magistra," there are a number of excellent groups of birds. In the museums of the American cities mentioned above, the huge family groups representing the bison, moose, elk, caribou, musk-ox, deer, antelope, eland, zebra, and other animals, all provided with carefully-studied natural accessories, constitute enduring monuments to the skill of American taxidermists.

Of all museum officers who have actively promoted the development of American taxidermy, Prof. Spencer F. Baird and Dr. G. Brown Goode stand first. As early as 1880 they advocated the attainment of perfection in results, regardless of time or cost. It was by their consent and co-operation that the National Museum set the pace in the development of large groups of mammals, which really began in 1887 with the group of American bison. In this connection, honorable mention is due Prof. Henry A. Ward, founder of Ward's Natural Science Establishment, for the far-reaching influence exerted by him for the improvement of taxidermic methods generally, and the co-operation which he extended to the Society of American Taxidermists.

With the improvements noted in museum taxidermy, equal advances have been made in the class of what is known as custom taxidermy. The number of trophy heads of large mammals that are now mounted annually in the United States can not be less than about 1,800. About two thirds are heads of deer, and the remainder consist of moose, mountain-sheep, caribou, elk, antelope, mountain-goat, buffalo, musk-ox, and bear, about in the order named. Twenty-five years ago a finely mounted head was a rarity, but to-day, outside of the workshops of amateurs, a badly-mounted head is seldom seen. The standards of excellence have risen very greatly. The demands of patrons are more intelligent, and good work is better compensated than heretofore.

As the world's mammals, birds and other vertebrates decrease, museums multiply, and the desire to provide fine collections becomes more earnest and insistent. Taxidermy now offers a good field for a limited number of young men of real artistic instincts who can bring to it adequate education and training, and unlimited capacity for hard work.

Three important and recent American works on taxidermy should be enumerated: Hornaday, 'Taxidermy and Zoological Collecting' (1892); Davie, 'Methods in the Art of Taxidermy' (1894); Rowley, 'Art of Taxidermy' (1900).

W. H. Hornaday,
Director New York Zoological Park.

Tax-Deed, an instrument or conveyance whereby the proper officer of the law undertakes to convey the title of the rightful owner to the purchaser at a tax sale or a sale of the land for non-payment of taxes.

This deed, according to the principles of the common law, is simply a link in the chain of the purchaser's title. It does not of itself transfer the title of the owner, as in grants from the government of deeds, or as do conveyances between individuals. The deed is not the title itself, or even evidence of it, its recitals not being binding. No presumption arises upon the mere production of the deed that the facts upon which it is based really existed, but when it is shown that the officers of the law have performed every duty imposed upon them the deed becomes conclusive evidence of the title in the purchaser.

Tay, tā, (1) A river in Scotland, in the county of Perth, formed by two head-streams, the one issuing from the northeast end of Loch Tay, and the other from Loch Lyon, a small lake on the borders of Argyllshire. The two streams unite about two miles northeast of Loch Tay, whence the river flows past Aberfeldy, Dunkeld, and Perth, at which last town it widens out into an estuary from one to three miles in breadth, separating the counties of Perth and Forfar on the north from Fife on the south. The whole length is 120 miles, and the area of basin 2,250 square miles. Vessels of 500 tons ascend to Newburgh, and those drawing nine feet to Perth. Its principal tributaries are the Tummel and Isla on the left, and the Bran, Almond, and Earn on the right. During the upper part of its course the Tay flows with a rapid current through a wild and highly romantic country, and subsequently, after entering Strathmore, through the richest and finest valley in Scotland. In the summer of 1878 a railway bridge spanning the estuary of the Tay at Dundee was opened for traffic, but on 28 Dec. 1879 13 spans, crossing the navigable part of the river, were blown down in a violent storm, a passenger train, which then happened to be crossing, being precipitated at the same time into the river. A second bridge, over two miles long, with 85 spans, and carrying two lines of rail, was opened in 1887. (2) A loch in the county of Perth, a picturesque sheet of water 15 miles long and about one mile broad; receiving at its southwest end (near Killin) the Lochay and the Dochart, and discharging at its northeast end at Kenmore by the Tay. It is 100 to 600 feet deep, and is well supplied with fish. On its northwest shore rises Ben Lawers.

Tayabas, tä-yä'bäs, Philippines. (1) Pueblo province of Tayabas; on Tayabas River, five miles inland, 65 miles southeast of Manila. Under Spanish jurisdiction it was the capital of the province, and is the largest town. It is an important road centre and carries on a large trade. Pop. 15,000. (2) Province, forming the western part of southern Luzon; bounded on the north by the Pacific Ocean, and Lamón Bay and Ambos Camarines, on the east by Ambos Camarines and the Visayan Sea, on the south by the Mindoro Sea, and on the west by Batangas and Laguna; area, 2,250 square miles, with dependent islands 2,334 square miles. The outline is very irregular; its extreme length from Point Piapi in the northwest to Point Pagsanján in the southeast is 102 miles; and the distance from the northeastern boundary to Sandoval Point on the southwest is 47 miles. Its coasts are indented by three of the largest bays of the Philippines, Lamón on the north, Ragay on the east, and Tayabas on the south. The province is generally mountainous, the main

central chain extends from northwest to southeast, and this range sends out spurs on each side. There are numerous small rivers and streams. The soil of the valleys is fertile; on the lower levels rice, sugar, and coffee are raised, and grain on the higher levels; a special product is a seed called lumbang from which an oil is made; the cocoanut is grown in large quantities. The forests contain a variety of woods for building purposes, besides gum and resin trees; and large quantities of timber and forest products are exported. The mechanical industries of this province are of considerable importance; the manufactures include hats, cigar cases, and boxes, and native fabrics; there are also mills for extracting cocoanut oil, and a number of boat-building yards for the construction of native boats. Stock-raising is also of some importance. The province has good communication by water with all parts of the Philippines, and it is traversed by the main highway from Sorsogón to Manila; there are also several other roads and trails. The inhabitants of the western part of the province are Tagalogs, those of the eastern part are Bicols. Civil government was established in March 1901, in accordance with the law of the Philippine Commission. Pop. (1901) 109,780.

Taygetus, tā-ĭj'ē-tŭs, Greece, a mountain range running down the central peninsula of southern Morea. It is a steep and unbroken ridge rising in Hagios Elias to a height of 7,904 feet. It separated ancient Sparta from Messenia and was known in the Middle Ages as Pentedaktylon.

Taylor, tā'lôr, **(James) Bayard**, American writer: b. Kennett Square, Pa., 11 Jan. 1825; d. Berlin, Germany, 19 Dec. 1878. He had a secondary education at West Chester and Unionville, and in 1842 was apprenticed to a printer in the former town, but did not serve out his apprenticeship. In 1844 he set sail for Liverpool, and during the next two years he traveled, chiefly on foot, in Great Britain, Belgium, Germany, Austria, Italy, and France. He described his journeys for several American newspapers, his letters being collected and published on his return under the title 'Views Afoot, or Europe Seen with Knapsack and Staff' (1846). In 1847 he received an appointment on the staff of the New York *Tribune*, and two years later went to California as special correspondent of that newspaper at the gold-fields, his letters being republished in 1850 as 'Eldorado, or Adventures in the Path of Empire.' In 1851 he was again in Europe, and before returning to the United States in 1854 he visited Egypt, Asia Minor, India, Hong Kong, China, and Japan. Among the literary results of this tour were: 'A Journey to Central Africa' (1854); 'The Land of the Saracen' (1854); and 'A Visit to India, China, and Japan' (1855). On these traveling experiences he lectured with much success. He had by this time gained some reputation as a poet by 'Ximena and Other Poems' (1844); 'Rhymes of Travel, Ballads, and Other Poems' (1848); 'A Book of Romances, Lyrics, and Songs' (1851); and 'Poems of the Orient' (1855); and in 1855 he published a collective edition of these under the title 'Poems of Home and Travel.' 'Northern Travel' (1857) contains an account of a visit to Sweden, Denmark, and Lapland. In 1862–3 he was secretary of legation and for a time *chargé d'affaires* at Saint Petersburg, and in 1870 he lectured at Cornell University on German literature. He became United States ambassador at Berlin in May 1878. In addition to works already mentioned the following may be enumerated: 'At Home and Abroad' (1859–62); 'Byways of Europe' (1869); a translation of Goethe's 'Faust' in the original metres (1870); the novels: 'Hannah Thurston' (1863); 'John Godfrey's Fortunes' (1864); 'The Story of Kennett' (1866); 'Joseph and His Friend' (1870); 'The Poet's Journal' (1863); and other volumes of verse. Two collections of miscellaneous writings appeared posthumously, 'Studies in German Literature' (1879) and 'Essays and Notes' (1880). It is by his translation of 'Faust,' one of the finest attempts of the kind in any literature, that Taylor is generally known; yet as an original poet he stands well up in the second rank of Americans. His 'Poems of the Orient' and his Pennsylvanian ballads comprise his best work. His verse is finished and sonorous, but at times over-rhetorical. Consult the 'Life and Letters' by his wife and H. E. Scudder (1884).

Taylor, Benjamin Franklin, American poet and journalist: b. Lowville, N. Y., 18 Aug. 1819; d. Cleveland, Ohio, 24 Feb. 1887. He was educated at what is now Colgate University, Hamilton, N. Y., and in 1840 joined the staff of the Chicago *Evening Journal* as literary editor. He was war correspondent for that paper during the Civil War and afterward traveled and lectured. He published: 'January and June' (1853); 'Pictures in Camp and Field' (1867); 'Old-time Pictures and Sheaves of Rhyme' (1874); 'Between the Gates' (1878); 'Theophilus Trent' (1887); 'Complete Poems' (1887); etc.

Taylor, Brook, English mathematician: b. Edmonton 18 Aug. 1685; d. 29 Dec. 1731. He was educated at St. John's College, Cambridge; in 1712 chosen a fellow of the Royal Society; and in January 1714 appointed its secretary. The most important of Taylor's works, published in 1715, is entitled 'Methodus Incrementorum Directa et Inversa.' It contains, among other theorems of less consequence, a celebrated one, which is hence called 'Taylor's Theorem,' the importance of which was first recognized by Lagrange, who proposed to make it the foundation of the differential calculus. His other works include two treatises on linear perspective, besides contributions to the 'Philosophical Transactions.'

Taylor, Charles Henry, American journalist: b. Boston 14 July 1846. He made his start in life as a printer and reporter and was private secretary to the governor of Massachusetts for three years. He served during the Civil War with the 38th Massachusetts Regiment and was lieutenant-colonel on the staff of Gov. Claflin. He was member of the legislature in 1872 and in 1873 became manager and editor of the Boston *Daily Globe*.

Taylor, Charles Jay, American artist: b. New York 11 Aug. 1855. He was graduated at Columbia College Law School (1874) and subsequently studied art at the Art

Students' League and in London and Paris. He has exhibited at the National Academy of Design; the Society of American Artists; the Pennsylvania Academy of Fine Arts; the Salon at Paris; the Chicago Institute; the World's Fair, Chicago; and the Exposition Universelle, Paris, 1900. He was awarded a medal at the Pan-American Exposition, 1901. His powers as an illustrator have been much appreciated and in addition to illustrating several books he has contributed cartoons to 'Life,' 'Puck,' 'Judge,' 'Punch,' and other serials.

Taylor, Dan, English Baptist church organizer: b. Northowram, Yorkshire, 21 Dec. 1738; d. London 26 Nov. 1816. He joined the Wesleyans in 1759 and engaged as a preacher for them, but in 1762 withdrew his membership and became preacher of a Methodist secession at Wadsworth, West Riding, Yorkshire. In 1763 he entered the Lincolnshire Association of General Baptists, was ordained a Baptist preacher. His congregation is usually considered the first general Baptist church in Yorkshire, and in 1764 they erected the Birchcliffe meeting-house. He engaged extensively in evangelical work and from the first favored the "new connexion" but did not formally leave the "general assembly" until 1803. He became pastor of a church at Halifax in 1783 and in 1785 was appointed associate pastor at Church Lane, London, becoming sole pastor on the death of his colleague, John Brittain, in 1794. In 1798–1813, without relinquishing his pastoral duties, he was theological tutor at the General Baptist Evangelical Academy at Mile End. He published: 'A Compendious View of Christian Baptism' (1772); 'The Eternity of Future Punishment' (1789); 'Memoirs of William Thompson' (1796); etc. Consult Adam Taylor, 'Memoirs of Daniel Taylor' (1820).

Taylor, Edward Thompson, American Methodist missionary: b. Richmond, Va., 25 Dec. 1793; d. Boston, Mass., 6 April 1871. He followed a sea-faring life until he was 17. He was captured on a privateer in the War of 1812, was taken to England, and while confined in the prison at Dartmoor acted as chaplain to his fellow captives. He was ordained in the Methodist ministry in 1819, and in 1828 became missionary of the Seamen's Bethel in Boston, a post in which he attained a wide reputation as a preacher. He was commonly known as "Father Taylor" and was greatly beloved in the community and by the sailors, over whom he exercised great influence. He made free use of nautical terms in his discourses, possessed a genial wit and much power of pathos and imagination. He visited Europe in 1832, Palestine in 1842, and was chaplain of the United States frigate Macedonian, sent in 1846 with relief for famine-stricken Ireland. While abroad he preached in Glasgow and in Cork.

Taylor, George, American statesman, one of the signers of the Declaration of Independence: b. Ireland 1716; d. Easton, Pa., 23 Feb. 1781. Disliking the medical profession, for which he was destined, he came to America as a "redemptioner," and on arriving bound himself for a term of years to an iron manufacturer at Durham, Pa. His education and intelligence being discovered, his employer made him his clerk, and after his death Taylor married his widow and became master of the establishment. He was a member of the provincial assembly in 1764–70, when he was a judge of the county court and colonel of militia. In October 1775 he was again elected to the provincial assembly, and was active in the promotion of revolutionary measures. The action of some of the members of the Continental Congress the next year in refusing assent to the declaration of independence, led to the election of new members, 20 July 1776, of whom Taylor was one. He signed the Declaration on 2 August, subsequently negotiated a treaty with several of the Indian tribes on behalf of the United States, and in March 1777 retired from Congress to private life.

Taylor, Hannis, American diplomatist: b. Newberne, N. C., 12 Sept. 1851. He was educated at the University of North Carolina and was minister to Spain 1893–7. He has been professor of constitutional and international law at Columbia since 1892, and was special counsel for the United States government before the Spanish Treaty Claims Commission. He has published 'The Origin and Growth of the English Constitution'; 'International Public Law.'

Taylor, Sir Henry, English poet and essayist: b. Bishop-Middleham, Durham, 18 Oct. 1800; d. Bournemouth 27 March 1886. At 14 he entered the navy as midshipman, but returned after a few months. In 1817–20 he held a small appointment in London. Retiring to his father's country home, he gave himself to serious study, and in 1822 wrote an article on Moore that was published in the 'Quarterly Review.' He went to London, and in 1824 received a clerkship in the Colonial Office, with which he retained his connection for 48 years. He mingled with the intellectual life of the city, contributed to the 'Quarterly Review,' and wrote his first tragedy, 'Isaac Comnenus,' in 1827. It was favorably reviewed by Southey, but failed to attract popular notice. From 1828 to 1834 he was engaged upon another poetic drama, 'Philip van Artevelde,' his principal achievement in literature. It was formed upon Elizabethan models, and its style is marked by dignity and refinement. His other works include: 'The Statesman' (1836), containing prose commentaries on official life and the conduct of business; 'Edwin the Fair' (1842), a historical drama; 'The Eve of the Conquest and other Poems' (1847); 'Notes from Life' (1847); 'The Virgin Widow,' a comedy afterward called 'A Sicilian Summer' (1850); and 'Saint Clement's Eve' (1862), a romantic drama. His autobiography was published in 1885. Consult his 'Works' (1878), and 'Correspondence,' edited by Dowden (1888).

Taylor, Henry Osborn, American author: b. New York 5 Dec. 1856. He was graduated from Harvard in 1878, and has published 'Treatise on the Law of Private Corporations'; 'Ancient Ideals'; 'The Classical Heritage of the Middle Ages' (1901).

Taylor, Isaac (known as Taylor of Ongar), English Congregational clergyman and author: b. London 1759; d. Ongar, Essex, 11 Dec. 1829. He was originally an engraver, but entered the ministry and was pastor at Colchester 1796–1810 and at Ongar, Essex, 1811–29. He published many works, chiefly books for the

young, among which are: 'Advice to the Teens'; 'Beginnings of British Biography'; 'Beginnings of European Biography'; 'Biography of a Brown Loaf'; 'Book of Martyrs for the Young'; 'Bunyan Explained to a Child'; 'Child's Life of Christ'; 'Mirabilia; or, The Wonders of Nature and Art'; 'Scenes in America, in Asia, in Europe, in Foreign Lands.'

Taylor, Isaac, English writer, son of the preceding: b. Lavenham, Suffolk, 17 Aug. 1787; d. Stanford Rivers 28 June 1865. His life was almost entirely passed in retirement at the place where he died, and is only remarkable for the works which he produced. His first book is entitled 'Elements of Thought' (1823). It was succeeded by numerous others, most of which are of a partly philosophical, partly religious cast. The principal are: 'The Natural History of Enthusiasm' (1829); 'The Natural History of Fanaticism' (1833); 'Spiritual Despotism' (1835); 'Physical Theory of Another Life' (1836); 'Ancient Christianity' (1839–43); 'Loyola and Jesuitism' (1849); 'Wesley and Methodism' (1851); 'Restoration of Belief' (1855); 'World of Mind' (1857); 'Ultimate Civilization' (1860); and 'Spirit of Hebrew Poetry' (1861). The first of these works is that by which his name is chiefly known, although originally published anonymously. The work on ancient Christianity was composed with the view of correcting the errors which the author believed many were likely to fall into in consequence of the appeals of the writers of the Oxford tracts to the authority and practice of the early Church.

Taylor, Isaac, English scholar, son of the author of 'The Natural History of Enthusiasm': b. Stanford Rivers, Essex, 2 May 1829; d. Settrington, Yorkshire, 18 Oct. 1901. He was graduated from Trinity College, Cambridge, and in the following year issued a translation of Bekker's 'Charicles.' He was ordained in 1857, and in 1860 published 'The Liturgy and the Dissenters.' In the latter year he became a curate in London, and in 1864 published the first of the works by which he is chiefly remembered, 'Words and Places, or Etymological Illustrations of History, Ethnology, and Geography.' In 1865–9 he held a curacy in a Bethnal Green parish, and his arduous labors there are described in 'The Burden of the Poor.' He became vicar of Holy Trinity, Twickenham, in 1869, and in 1875 was presented to the rectory of Settrington, near Malton, in Yorkshire, which he retained till his death. In 1879 he first propounded the theory of the Greek origin of runes in a work entitled 'Greeks and Goths: A Study on the Runes'; and he published in German a treatise 'Ueber den Ursprung des glagolitischen Alphabets,' but his *magnum opus,* 'The Alphabet: an Account of the Origin and Development of Letters,' did not appear till 1883. In 1885 he was appointed canon of York. His other works include: 'The Family Pen: Memorials, Biographical and Literary, of the Taylors of Ongar' (1867); 'Etruscan Researches' (1874); 'Leaves from an Egyptian Note-Book' (1888); 'The Origin of the Aryans' (1889); and 'Names and their Histories: A Handbook of Historical Geography and Topographical Nomenclature' (1896).

Taylor, Isaac Ebenezer, American physician: b. Philadelphia 25 April 1812; d. New York 30 Oct. 1889. He was graduated from Rutgers College in 1830, and in medicine from the University of Pennsylvania in 1834. He subsequently studied in Europe, settled in New York, and had charge of the department of women's diseases at the City, Eastern, Northern, and Demitt dispensaries, for seven years each. In 1851 he was elected physician to Bellevue Hospital, where he initiated important reforms, secured the foundation of the hospital college, and became its head, 1861. He was subsequently president of the medical board of the hospital; attending physician and head of the medical board of the Charity Hospital; and obstetrical physician to the Maternity Hospital. He was the first American to introduce uterine auscultation, helped introduce the hypodermic method of treatment by morphia and strychnia, and was the earliest in this country to use the speculum in diseases of women and children. He published a monograph on this subject in 1841.

Taylor, James Munroe, American college president: b. Brooklyn, N. Y., 5 Aug. 1848. He was graduated from the University of Rochester in 1868, and was pastor of a Baptist church in South Norwalk, Conn., 1873–82, and at Providence, R. I., 1882–6. Since 1886 he has been professor of ethics and president of Vassar College. He has published: 'Psychology' (1893); 'New World and Old Gospel' (1900); 'Practical or Ideal' (1901).

Taylor, Jane, English poet and author, daughter of Isaac Taylor, 1759–1829 (q.v.): b. London 23 Sept. 1783; d. Ongar, Essex, 12 April 1823. She was educated under the supervision of her father and early displayed literary ability. Her work, which was very successful, bears some similarity in thought to that of Cowper. Her first work was 'The Beggar Boy' (1804) and in conjunction with her sister Ann (Mrs. Gilbert, of Nottingham, 1783–1824), she published: 'Original Poems' and 'Hymns for Infant Minds.' Her other work includes: 'Display,' a didactic tale (1815); 'Essays in Rhymes' (1816); and (published posthumously) 'Contributions of Q. Q. to a Periodical' (1826); 'Correspondence' (1825); etc. Consult Isaac Taylor, 'Memorials of the Taylor Family' (1867).

Taylor, Jeremy, English prelate and author: b. Cambridge 1613; d. Lisburn, County Antrim, Ireland, 13 Aug. 1667. After graduation in 1630 from Caius College, Cambridge, he was ordained in 1634, attracted some attention by his divinity lectures at Saint Paul's, and was sent by Laud to Oxford, where he was admitted perpetual fellow in 1636. He was presented to the rectory of Uppingham, Rutland, in 1638, to that of Overstone, Northamptonshire, in 1643. By this time he had made much of a reputation by his casuistical discourses. In the civil war he was committed to the Royalist party. As chaplain in ordinary to the king, he accompanied the army, and was taken prisoner by the Parliamentarians in the battle before Cardigan Castle (1645). Soon released, he remained in Wales, having found, as he later said, that the «great storm» had «dashed the vessel of the church all in pieces.» Whi'e

chaplain to Richard Vaughan, Earl of Carbery, at Golden Grove, Carmarthenshire, he did some of his best literary work, including 'The Liberty of Prophesying' (1646); 'Holy Living' (1650); and 'Holy Dying' (1651). He was twice imprisoned at Chepstow, occasionally preached to small Episcopalian congregations in London, and in 1658 was appointed to a weekly lectureship at Lisburn, County Antrim. In April 1660 he signed the "declaration" of the Loyalists, and in August following the Restoration was made bishop of Down and Connor. He found the diocese a troublesome one, owing to difficulties with the Presbyterian leaders, who refused to recognize episcopal jurisdiction. At his first visitation he declared 36 churches vacant, their incumbents not having been episcopally ordained. Contrary to his purpose, he contributed greatly toward the establishment of loyalist Presbyterians in northern Ireland as an independent ecclesiastical organization. Of his works, the best known is probably the 'Liberty of Prophesying' — by which he meant expounding — a defense of toleration. He rests his plea for private judgment on the uncertainty and inadequacy of tradition, the fallibility of any arbiter that may be selected on points of controversy, and the difficulty of expounding the Scriptures. Coleridge thought the result of the argument was that "so much can be said for every opinion and sect" that appeal must be made to "some positive jurisdiction on earth" Perhaps Taylor's was merely a "legal settlement." At any rate, it is otherwise inconsistent with his procedure in Ireland. But he was at his best not as an accurate theologian or polemic but as a preacher of righteousness. His literary genius is generally thought to be seen to best advantage in his sermons. They do not lack rhetorical faults — redundancy, diffuseness, a burdensome extent of quotation and illustration; but they are always eloquent, with a certain vividness, dignity, and solidity for which many critics have been unable to find an equal in English prose. His devotional works, inspiring for their deep piety, are also highly valued for their usefulness. Next to the 'Liberty of Prophesying' they are most famous among Taylor's writings, and now the most widely read. There are collected editions by Bishop Heber (1820–2) and by Eden (1847–54). Consult: Coleridge's 'Literary Remains'; Hunt, 'Religious Thought in England' (1870); Tulloch, 'Rational Theology' (1872); Barry, 'Classic Preachers' (1878); Dowden, 'Puritan and Anglican' (1901); 'Life' by Heber (1822), revised by Eden (1854); Gosse, 'Jeremy Taylor' (1904).

Taylor, John, English poet: b. Gloucestershire 24 Aug. 1580; d. London 25 July 1654. When young he was taken to London and apprenticed to a waterman, hence the title of "water-poet," by which he is commonly known. He was at the taking of Cadiz, under the Earl of Essex, in 1596, and afterward visited Germany and Scotland. At home he was many years collector for the lieutenant of the Tower of London of his fees of the wines from all the ships which brought them up the Thames. When the civil war broke out he retired to Oxford, where he kept a common victualing house; and wrote pasquinades upon the Roundheads. He afterward kept a public house at Westminster. Certain of his works are published under the title 'All the Works of John Taylor, the Water-Poet, being Sixty and Three in Number, collected into one volume by the author, with sundry new Additions, corrected, revised, and newly imprinted' (1630). His pieces were subsequently increased to more than double that number. They are not destitute of natural humor, and of the jingling wit which prevailed so much during the reign of James I. As a mirror of the coarse manners of his times they are invaluable to the historian and antiquary.

Taylor, John, Mormon president: b. Milnthorp, Westmoreland County, England, 1 Nov. 1808; d. Salt Lake City, Utah, 25 July 1887. He was born of parents professing the faith of the Church of England, but while a youth became a Methodist local preacher. In 1832 he emigrated to Canada and in 1835 was converted to the Mormon faith during the missionary tour of Porley P. Pratt. He was ordained a high priest by Joseph Smith in 1837 and in 1840 went as a Mormon missionary to various parts of the British Isles. The following year he returned and settled at Nauvoo, Ill., where in 1844, in company with several other Mormon leaders, charges of sedition and disloyalty were brought against him. The Carthage jail where the prisoners were confined was attacked by a mob, two of his companions were killed, and he was severely wounded. Returning from a second mission to England in 1846 he went to the new Mormon settlement in Salt Lake City, and in 1849 was elected an associate judge of the Mormon State of Deseret. He subsequently translated and published the 'Book of Mormon' in French and German. In 1854 he was elected a member of the legislative council, and the next year began a mission in New York, published 'The Mormon,' and took charge of Mormon followers in the East. From 1877 to 1880 he was president of the Twelve Apostles, and in the latter year organized the first presidency of the Church anew, and took the chief place himself. In March 1885 he was among those indicted by a Federal grand jury under the Edmunds law; but remained in concealment until his death.

Taylor, Mary Imlay, American novelist. She has published 'An Imperial Lover'; 'On the Red Staircase'; 'A Yankee Volunteer' (1898); 'The Cardinal's Musketeer' (1900); 'The Cobbler of Nimes' (1900); 'Anne Scarlett' (1901); 'Little Mistress Good Hope' (1902); 'My Lady Clancarty' (1904).

Taylor, Nathaniel William, American Congregational clergyman: b. New Milford, Conn., 23 June 1786; d. New Haven, Conn., 10 March 1858. He was graduated at Yale in 1807, and five years later became the pastor of the First Congregational Church at New Haven, in which position he continued until 1822, when he resigned to become professor of theology at Yale. This chair he held during the remainder of his life. He maintained the "New Haven theology," and especially on the doctrine of total depravity, which was regarded as heretical, led him into a controversy with the less liberal branch of the Congregational Church in 1828–30. His works were edited and published by Noah Porter (1858–9).

Taylor, Philip Meadows, English military officer and author: b. Liverpool 25 Sept. 1808; d. Mentone, France, 13 May 1876. He entered the nizan's army in India in 1824, and in 1841 was made administrator of the state of Shorapore, subduing its rebellious ruler. He rendered valuable service in keeping order during the Berar mutiny in 1857, for which he was promoted to the rank of colonel. He published 'Confessions of a Thug' (1839); 'Tara' (1863); 'Ralph Darnell' (1865); 'Manual of the History of India' (1870); 'A Noble Queen' (1878); and other works. His autobiography was published in 1877.

Taylor, Richard, American soldier, son of Zachary Taylor (q.v.): b. New Orleans, La., 27 Jan. 1826; d. New York 12 April 1879. He was graduated from Yale in 1845, after which he went to his father's camp on the Rio Grande and was present at Palo Alto and Resaca de la Palma. He sat in the Louisiana senate in 1856–60, and was a member of the Louisiana Secession convention. He aided in the organization of the Confederate troops, commanded a brigade under "Stonewall" Jackson, and fought at Front Royal, Middletown, Winchester, Strasburg, Cross Keys, Port Republic, and also in the seven days' battle before Richmond. He was then promoted major-general and assigned to the command of Louisiana, where he succeeded in strengthening the Confederate position, an advantage which was lost by the fall of Vicksburg in 1863. On 8 April 1864 he met and defeated Gen. Banks at Sabine Cross-Roads, but in the following day lost his advantage and was in his turn defeated. He was promoted lieutenant-general in 1864 and placed in command of the Department of Alabama and Mississippi. After the surrender of Lee and Johnston he capitulated to Gen. Canby at Citronelle, 8 May 1865. He published 'Destruction and Reconstruction' (1879).

Taylor, Rowland, English martyr: b. Rothbury, Northumberland; d. Hadleigh, Suffolk 8 Feb. 1555. He was graduated at Cambridge University and appointed by Cranmer, to whom he was domestic chaplain, rector of Hadleigh, and he became archdeacon of Exeter and a canon of Rochester. Under Mary he was imprisoned as a heretic for more than a twelvemonth and on being condemned to the stake suffered at Hadleigh. Consult Cooper, 'Athenæ Cantabrigienses' (1858).

Taylor, Thomas, English scholar: b. London 15 May 1758; d. Walworth 1 Nov. 1835. He was educated (with the idea of becoming a Dissenting minister) at Saint Paul's school, London, but entered a banking house as clerk, and subsequently served for several years as assistant secretary to the Society for the Encouragement of Arts, Manufactures, and Commerce. On the condition of his devoting himself to literary work for the last 40 years of his life he received during that period a pension of $500 a year from his friend W. Meredith, who also defrayed the expenses of publishing his translation of 'Aristotle' in 10 vols. (1806–12). His edition of 'Plato' in English (1804) was published at the expense of the Duke of Norfolk, who locked up nearly the whole edition in his own house, where it remained until 1848 when it was sold by auction. Taylor's works comprise about 60 volumes and include treatises on arithmetic and geometry, and translations of Proclus and Plotinus. Opinions differ as to the exactness of his scholarship, but he well deserved his title of "Platonist" and did good service to British philosophy and literature by introducing to the public as completely as possible the masters of Greek thought in an English garb.

Taylor, Thomas, American chemist: b. Perth, Scotland, 22 April 1820. He was educated at the Andersonian University, Glasgow, and afterward made a special study of chemistry, frictional electricity, and galvanism. He invented (1841) the first interleaved electric condenser as an improvement on the Leyden jar; a pneumatic battery for the purpose of igniting explosives in mining and blasting, and other mining and electrical appliances. He came to the United States in 1851, became connected with the ordnance department at Washington and during the Civil War was in charge of the rifle shell branch at the Washington Arsenal. He proved that electricity could be transmitted without wires to a given point across sea, invented improved rifle projectiles, rubber plate molds, and in 1871–95 was chief of the division of microscopy in the United States Department of Agriculture. He has published: 'Student's Handbook of the Mushrooms of America' (1898); 'Edible and Poisonous Mushrooms'; 'Causes of Bursting of Heavy Ordnance'; 'The Common House-Fly as a Carrier of Poisons'; etc.

Taylor, Sir Thomas Wardlaw, Canadian jurist: b. Auchtermuchty, Fifeshire, Scotland, 25 March 1833. He was educated at Edinburgh University, removed to Canada, and in 1858 was admitted to the bar of Upper Canada. He was master in chancery 1872–83, and puisne judge of queen's bench of Manitoba 1883–7. From 1887 to 1899 he was chief justice of Manitoba, and administrator of the government of that province in 1890 and 1893. His specialty is equity jurisprudence, and he has published 'Commentaries on Equity Jurisprudence' (1875); 'Chancery Statutes and Orders'; 'Public Statutes Relating to the Presbyterian Church.'

Taylor, Tom, English dramatist and journalist: b. Bishop-Wearmouth (Sunderland) 19 Oct. 1817; d. Wandsworth 12 July 1880. He was educated at the University of Glasgow, and at Trinity College, Cambridge, graduating from the latter in 1840. He was elected a fellow of his college in 1842, and in 1845–7 he was professor of the English language and literature in University College, London. Called to the bar in 1846, he was on the northern circuit for a time, but in 1850 was appointed assistant secretary, in 1854 secretary, to the Board of Health. On the formation of the Local Government Board he was made secretary of the sanitary department, and when his post was abolished in 1871 he retired with a pension. He engaged in journalistic work at an early stage in his career, and in 1844 began his connection with 'Punch,' which continued until his death; in 1874 he succeeded Shirley Brooks as editor. He was the author of a large number of successful plays, including 'To Parents and Guardians' (1845); 'Masks and Faces' (1852), in collaboration with Charles Reade; 'To Oblige Benson' (1854), an adapta-

Zachary Taylor

tion from the French; 'Our American Cousin' (1858), first produced at Laura Keane's theatre, New York, when Sothern created the character of Lord Dundreary; 'New Men and Old Acres' (1859), partly by A. W. Dubourg; 'The Overland Route' (1860); 'The Ticket-of-Leave Man' (1863), based upon a French work; 'The Fool's Revenge' (1869), based upon Hugo's 'Le Roi S'Amuse'; 'Twixt Axe and Crown' (1870), adapted from the German; 'Joan of Arc' (1871); 'Lady Clancarty' (1874); and 'Settling Day' (1877). At the time of the death of Lincoln he wrote a poem at once in eulogy of the martyr and in "atonement of Mr. Punch."

Taylor, William, American Methodist bishop: b. Rockbridge County, Va., 2 May 1821; d. Palo Alto, Cal., 18 May 1902. He became a Methodist preacher in 1842, served as an itinerant until 1849 and was then sent as missionary to California. He was engaged in that field until 1856 after which he spent five years in Canada and in the eastern States. In 1862 he went out as an evangelist and continued his work for many years in Australia, Asia, Africa, and South America. He was particularly successful in his work among the Kaffirs in South Africa, where he established numerous independent mission churches, and in 1884 was elected missionary bishop for Africa. He is said to have visited in the course of his missionary work every English-speaking country in the world. After his elevation to the office of bishop he went to Central Africa where he established a chain of 36 mission stations along the Kongo. He published: 'Seven Years Preaching in San Francisco' (1856); 'Infancy and Manhood of Christian Life' (1867); 'The Story of My Life' (1882); 'Pauline Methods of Missionary Work' (1889); etc.

Taylor, William Alexander, American journalist and author: b. Perry County, Ohio, 25 April 1837. He studied law and was admitted to the bar in 1858. He entered journalism in 1863; was a soldier in the army of the Potomac in the Civil War; served on the editorial staff of the leading daily newspapers in Pittsburg, New York and Columbus, and has been for 25 years on the staff of the Cincinnati *Enquirer*. He was Democratic candidate for secretary of state of Ohio in 1892, and for lieutenant-governor in 1893. He has published 'Eighteen Presidents' (1876); 'The Peril of the Republic' (1885); 'Ohio Statesmen' (1900); 'Ohio in Congress' (1901); 'Intermere' (1902); 'The Next Morning Philosopher' (1903); etc.

Taylor, Zachary, 12th president of the United States: b. Orange County, Va., 24 Sept. 1784; d. Washington, D. C., 9 July 1850. His father, Colonel Richard Taylor, came of a distinguished Virginia family, and served throughout the Revolutionary War. In 1785 the family removed to Kentucky, where Zachary received his early education, although of school training he had but little. In 1808 he was commissioned lieutenant in the 7th infantry, succeeding his deceased brother Hancock; was promoted captain in 1810; and after the opening of hostilities in the War of 1812 was placed in command of Fort Harrison, on the Wabash above Vincennes, for his successful defense of which against Indians he was brevetted major, and in 1814 he was promoted to the full rank. After the war he resigned, but in 1816 returned to the army as major of the 3d infantry. In 1832, as colonel of the 1st infantry, he fought in the Black Hawk War. In 1836 he went to Florida to engage in the Seminole War (q.v.), and at Okeechobee broke the Seminole power. In 1838 he was appointed to the chief command in Florida, and in 1840 was assigned to the command of the Southern division of the Western department of the army. At his own request he was relieved from this command in the same year, and later was assigned to the Arkansas frontier. On 1 March 1845 the joint resolution annexing Texas having been passed by Congress, he was instructed to hold his troops in readiness to meet the expected Mexican invasion. In November he occupied Corpus Christi with about 1,500 men and there was reinforced by 2,500 regulars and volunteers. No further move was made for several months. On 8 March 1846 Taylor advanced toward the Rio Grande, and encamped at Fort Brown opposite Matamoras. On 12 April the Mexican commander, Ampudia, demanded his withdrawal beyond the Nueces River, claimed by the Mexicans as the limit of the Texan territory. Taylor declined to move; but he withdrew 1 May to Point Isabel (about 30 miles) to secure his base. During his absence the new Mexican commander, Arista, crossed Rio Grande below Fort Brown, and waited to interrupt Taylor on his return. This movement was followed (8 May) by the battle of Palo Alto (q.v.) and (9 May) the battle of Resaca de la Palma (q.v.). On 18 May Taylor occupied Matamoras without opposition. He was brevetted major-general 28 May, 29 June received his full commmission, and remained at Matamoras until September. On 19 September he appeared before Monterey (q.v.), which, after a three days' engagement, capitulated. Gen. Taylor then began to prepare for an advance upon the City of Mexico. But Gen. Scott was sent with discretionary power to take what he thought necessary of Taylor's troops and equipment and make the advance into Mexico by way of Vera Cruz (q.v.). His army was now reduced to about 5,400 men, and this seemed to Santa Anna, the Mexican commander, the appropriate time to strike a telling blow for recovery of the lost territory. Gen. Taylor, hearing of his advance with the flower of the Mexican army, fell back toward Buena Vista (q.v.), where (22–3 Feb. 1847), he won a memorable victory. Taylor held the valley of the Rio Grande until November, and then returned to the United States to find that his sobriquet, "Old Rough and Ready," given him by his soldiers, was on every tongue. He was nominated for the presidency by the Whigs (8 June 1848), and was elected over Cass, Democrat, and Van Buren, Free-soiler. The great party questions at this time concerned the organization of new Territories, the admission of California, the boundary between Texas and New Mexico, and the extension of the slave power. Much of the strife was temporarily allayed by the Compromise of 1850 (q.v.), still pending in Congress when the President died, 16 months after his inauguration. Consult Howard, 'General Taylor' (1892). See MEXICAN WAR; MEXICO; UNITED STATES.

Taylor, Texas, town in Williamson County; on the Missouri, Kansas & Texas and the International and Great Northern R.R.'s; about 40 miles northeast of Austin, the capital of

the State. It is in an agricultural and stock-raising section. The chief manufacturing establishments are cottonseed-oil mills, cotton-compresses, railroad shops, flour and planing mills. In 1900 there were 72 manufacturing establishments, which employed 207 persons. The value of the annual output was $429,955. There are large shipments of grain, vegetables, cotton products, fruit, and live-stock. The two national banks have a combined capital of $250,000. Pop. (1890) 2,584; (1900) 4,211.

Taylor Institution, Oxford, England, connected with the University, is designed mainly for the promotion of the study of modern European languages. It owes its foundation to a bequest of Sir Robert Taylor. The building belonging to it was erected in 1848. The institution comprises four teacherships of modern European languages and a library, and there are in connection with it a scholarship and an exhibition. It is under the management of nine curators, all of whom must be members of convocation. The library is open free to all members of the university, and other literary persons may be admitted by special permission. The curators of the institution have also the administration of a fund bequeathed by William Thomas Horner for the encouragement of the study of the Polish and other Slavonic languages.

Taylor University, located at Upland, Ind. The forerunner of the University was the Fort Wayne Female College organized in 1846 at Fort Wayne, Ind., in 1852 this college united with the Collegiate Institute at the same place, and became a coeducational school. The name was changed to Taylor University in 1890; and in 1893 a new charter was obtained; and the University was moved to its present site, the citizens of Upland donating 10 acres of ground valued at $10,000. It is under the control of the National Association of Local Preachers of the Methodist Episcopal Church. It was named for Bishop Taylor, the first Methodist missionary bishop to Africa, who had a part in the organization. The departments of the University are the Preparatory Department, the Wright College of Liberal Arts, the Reade Theological Seminary, the Normal Department, the Commercial Department, and the Music Department. The college offers four courses, classical, scientific, philosophical and literary, leading respectively to the degrees of A.B., B.S., Ph.B., and B.L. A part of the work in the Junior and Senior years of each course is elective. The Theological School offers two courses for undergraduates, the English and the Classical (with Latin or Greek) and a full professional course for college graduates leading to the degree of A.B. The Normal course is three years in length; the Commercial Department offers two courses in bookkeeping and shorthand, each one year in length, which may be combined in a two years' course. The spirit of the college is markedly religious, a number of graduates every year become missionaries; and the students' religious organizations are strong. The library in 1904 contained 4,500 volumes; the students numbered 265, and the faculty 15.

Tay'lorville, Ill., city, county-seat of Christian County; on the South Fork of the Sangamon River, and on the Wabash and the Baltimore & Ohio Southwestern R.R.'s; about 24 miles southeast of Springfield and 27 miles southwest of Decatur. It is in an agricultural and coal mining region, and has considerable manufacturing interests. The government census of 1900 gives the number of manufactories 60; the capital invested, $229,598; the value of the products, annually, $281,762. The chief shipments are coal, hay, live-stock, and manufactures. There are eight churches, a high school, graded schools, and a public library. There are three banks, one national with a capital of $80,000, and two private banks. Pop. (1890) 2,829; (1900) 4,248.

Tayra, tī-ra, a brown, elongated, weasel-like fur-bearer (*Galictis barbara*) of Mexico and South America, which sometimes gathers in large bands. It has a long bushy tail.

Taytay, tī-tī', Philippines. (1) Pueblo, province of Paragua, island of Palawan; on the northeast coast on Taytay Bay. It is the chief town of the province and is protected by a fort mounting several guns and capable of accommodating a garrison of 700. Agriculture and fishing are the chief industries. Pop. (estimated) 7,420. (2) Pueblo, province of Rizal, Luzon, 10 miles east of Manila. Pop. 6,800.

Tayug, tä-yoog', Philippines, pueblo, province of Pangasinán, Luzon; in the extreme northeast of the province, near the Agno River; 34 miles east of Lingayen. It is on the highway from San Quintin to Aseñgan. Pop. 19,612.

Tchad, chād, or **Chad,** Africa, a large lake in the Sudan, situated around the common boundary point of Kamerun, British Nigeria and French Sahara, lat. 13° N. and lon. 14° E. Its area during the rainy season is about 30,000 square miles, but in the dry season it shrinks to less than 7,000 square miles, and is then surrounded by vast marshes, while the remaining water is very shallow. The water is fresh, although the lake has no apparent outlet; it is believed to discharge through subterranean channels. The eastern half is full of islands densely populated by negro tribes.

Tchaikovsky, chī-kōf'skē, **Peter Ilich,** the greatest of Russian composers: b. Votinsk, government of Viatka, 7 May (not 25 Dec.) 1840; d. Saint Petersburg 6 Nov. 1893, of cholera. His father, a mining engineer, had no intention of making a musician of him, but had him educated at the Technological Institute in Saint Petersburg, after leaving which he obtained a post in the Ministry of Justice. But Peter was a gifted amateur, whose playing in social circles was much appreciated. In 1861 he wrote to his sister: "I told you I was studying the theory of music with considerable success. It is generally agreed that with my uncommon talents (I hope you will not take this for mere boasting) it would be a pity not to try my luck in this career." Shortly thereafter he entered the Conservatory, where he soon attracted the attention of Anton Rubinstein, who relates that once he gave the young man a theme and asked him to write a set of variations on it. He expected about a dozen, but Tchaikovsky brought him over 200! From Rubinstein he also took lessons in orchestration; the instruments on which he practised were the piano and the organ; also the flute, of which he afterward made such admirable use in his 'Nutcracker Suite' and other works. His talent was ere long generally appre-

ciated; in 1865 Laroche, afterward an eminent critic, referred to him as "the future star of Russian music"; this led to his being sent to Moscow in 1866, to teach the theory of music at the newly opened Conservatory. Although he disliked giving lessons, he proved a conscientious and useful teacher. Thenceforth he devoted most of his spare time to composing; but although he had "an almost feminine craving for approval and encouragement," his experiences were little more than a series of disappointments. His worldly prospects nevertheless steadily improved, and in 1877 he married, to the surprise of his friends. The hasty marriage had a tragic sequel. The union was not a happy one, and the pair soon separated. The composer was so despondent that he attempted to commit suicide in such a way as to avoid scandal by standing up to his chest in the icy river one night, in the hope of catching a deadly cold. In the following year another woman influenced his life, in a happier way. He did not know her, and she preferred to keep her identity concealed, but she put aside for his benefit a sum of money which made it possible for him to give up his Conservatory classes and save his energy for his creative work. Many master-works now came from his pen. He had never cared for society, and detested city life, so his friends were not surprised when, in 1885, he took a house near the village of Klin, where he was isolated as completely from the world as was Wagner when he wrote his 'Meistersinger' score in his villa near Lucerne. He became known as "the Hermit of Klin," and refused to see any one but friends and such musicians as he chose now and then to invite for a party. By constitution he was strong, wiry, and not easily fatigued; he was fond of outdoor exercise, and many of his musical ideas came to him on his walks. He aged much as he neared his fifties; his scant hair grew white and his face lined. In May 1891 he visited America and gave concerts in New York and other cities. Two years later he conducted some of his works at Oxford and received the degree of Doctor of Music from the University. In the autumn of 1893 the world was startled by the news of his death. He succumbed to an attack of cholera, after a short illness. There were rumors of his having committed suicide, but his friend and biographer Kashkin discountenances them.

The suicide rumors were strengthened by the character of his last symphony, which is now known throughout the world as the 'Pathetic,' the most lugubrious of all symphonic works. A more heart-rending wail of grief than its adagio lamentoso has never been heard; and as this slow movement, contrary to all precedent, closes the symphony, it seemed like an intentional farewell to the world. "This music," says Hunecker, "is a page torn from Ecclesiastes; it is the cosmos in crape." Schubert once said that the world liked best those of his songs which were born of sorrow. It was the doleful 6th symphony that made Tchaikovsky famous. Seldom has a work so great and deep won so instantaneous a success — a success so remarkable as to unduly overshadow his other five symphonies, except, to some extent, the 5th, which resembles the 6th in mood and music. Like Beethoven, Tchaikovsky is greatest in his orchestral works, which include, beside the six symphonies, seven symphonic poems: 'The Tempest'; 'Francesca da Rimini'; 'Manfred', 'Romeo and Juliet'; 'Hamlet'; 'Fatum'; 'Le Voyevode.' In these, which contain some of his best and most mature music, he manifests his sympathy with Liszt and modern programme music. Among his other orchestral works the three that have become most famous are the '1812' overture, the 'Marche Slave' and the 'Nutcracker Suite,' which contains the best musical numbers of one of his three ballets. His 11 operas are much less modern in spirit and structure than his symphonic works, and the only one of them that has attracted much attention outside of Russia is the 4th, 'Eugene Onegin.' It has been said of his operas that "just as the gracious beauty of Italian melody seemed doomed to pass away under a new dispensation, it was reincarnated in the works of this northern composer." There is much beautiful melody also in some of his 100 lyric songs; the best-known of them are the 'Spanish Serenade,' 'None but a Lonely Heart,' 'Why so Pale are the Roses.' Not a few of the songs are pot-boilers, and the same is true of many of his pianoforte pieces, the best of which, however, deserve to be better known. Pianists neglect them because of their awkward technique. Three pianoforte concertos, a violin concerto, a string sextet, and other pieces of chamber music must be added to the list of his compositions. His work as a whole is characterized by a remarkable variety; now it is classical, even old-fashioned, now ultra-modern; now Russian, now cosmopolitan. German critics have described his symphonies as rough, patchy, barbarous, nihilistic; but music lovers the world over are showing a keener insight, and are learning to love this Russian music as they learned to love the Polish music of Chopin, the Hungarian of Liszt, the Norwegian of Grieg. The authoritative life of Tchaikovsky has been written by his brother Modest. A shorter volume (in English) by Rosa Newmarch, includes extracts from his critical writings and diaries. Consult also Kashkin, 'Reminiscences'; Huneker, 'Mezzotints in Modern Music'; Riemann, 'Geschichte der Musik seit Beethoven.' A 'Catalogue Thematique' of the compositions is issued by Jurgenson, Moscow.

HENRY T. FINCK,
Musical Editor New York 'Evening Post.'

Tchikun, an American Indian tribe of the Apache (q.v.) family, formerly residing at Hot Springs, N. Mex.

Te Deum Laudamus, tē dē'ŭm lâ-dā'mŭs, or more abbreviated, **Te Deum,** is the beginning of the hymn of praise usually ascribed to St. Ambrose and St. Augustine, although it cannot be traced farther back than the end of the 5th century, while St. Augustine, the latter of the two mentioned, died in 430. The opening words, meaning, "We praise thee as God," show that it was originally a hymn to Christ, but it is now always regarded as a hymn to the Father, the English version beginning, "We praise thee, O God." In addition to its place in church services it is often sung on particular occasions, as on the news of victories and on high festival days. Among the modern composers of this hymn are Hasse, Naumann, Haydn, Danzi, Schicht, and Handel.

Tea, a shrub or small tree (*Camellia thea*) of the order *Ternstræmiaceæ*. The plant sometimes attains a height of 30 feet, but under cultivation seldom exceeds five or six feet. It bears evergreen, lanceolate leaves about four inches long and rather large fragrant white flowers singly or in twos or threes, mostly in the axils of the leaves. It is a native of India and China, and has been cultivated in the latter country more than 2,000 years. Two botanical varieties, formerly considered distinct species, are recognized: *C. thea*, var. *bohea*, and *C. thea*, var. *viridis*. These are of especial interest since they were formerly considered to produce the black and the green teas of commerce. This vagary was dispelled by Robert Fortune, who found that while the black teas of Canton were produced from the former variety, and the green teas of Che-kiang from the latter, yet the black teas of the Fokien district were produced from the latter also. The difference between black and green teas is not due to the variety but to the process of manufacture.

The history of the tea-growing industry is said to have commenced in Korea before the 4th century before Christ, and to have reached Japan more than 1,000 years later. Tea was unknown to Europeans until the 16th century when Maffei, a Portuguese, mentions it in his 'Historiæ Indicæ' as a product of Japan and China. Not until 1615, however, was it mentioned by an Englishman, when Wickman wrote about it in a letter now owned by the East India Company. During that century small quantities found their way as presents to wealthy Londoners or later into the markets where they commanded £10 or £5 a pound. In 1657 a considerable quantity was purchased by Thomas Garraway, who opened a sort of restaurant where the beverage was served. As the importations increased, the customs and the excise each affixed duties. At one time (1660–89) a duty of 8d a gallon was levied upon the beverage. And somewhat later 5s plus an ad valorem duty of 5 per cent was also operative. The American tea trade began in 1784 and within three years had developed to more than 1,000,000 pounds. The first direct importation from Japan came from Yokohama to San Francisco in 1868. Since 1870 the annual average importation is somewhat in excess of $15,000,000.

From the beginning of the commerce in tea, China has held first place as a producing and exporting country. The choicest grades, however, are probably unknown in America, but are consumed mostly at home or in Russia, where they command enormous prices. The reasons assigned for the non-exportation to distant countries are that the quality usually deteriorates during long transportation, and that some kinds do not keep well unless highly "fired," a process which impairs their flavor. The industry attracted the attention of the English in India and in 1836 Royle and Falooner, British botanists, commenced in Ceylon to experiment upon an extensive scale. The result was several brands of tea which were superior to many of the Chinese teas. Ceylon and adjacent India now rank next to China in volume of exports. Tea has been grown more or less in other subtropical and tropical climates, notably in Brazil, where somewhat more than a domestic supply is raised.

In the United States the first tea shrub was planted at Middleton Barony, S. C., in 1800 by the French botanist Michaux. It was still living at the close of the 19th century, when it was about 15 feet high. In 1848 experiments were made upon an extensive scale by Junius Smith, of Greenville, S. C., and in 1858 the government engaged Robert Fortune to collect tea seed for distribution in the South. These experiments were cut short, the former by the death of the experimenter, the latter by the Civil War. About 1880, the United States Department of Agriculture commenced experiments which were abandoned owing to various changes in the staff, and the distance from the managing headquarters. About 10 years later Mr. Charles U. Shepard, of Summerville, S. C., devoted his private means to tea experimentation. His opinion was that the previous experiments had not been conclusive and that the production of high grade teas at a profit to the grower could be accomplished in many Southern States and that a demonstration would attract capital to the industry. Once demonstrated as profitable he believed that the industry would furnish employment to many thousands of people, especially women and children, and would make valuable large areas of land which yielded little or nothing. In 1900 he had about 60 acres planted to this crop, a factory fully equipped, a trained band of pickers and facilities for meeting every requisite from planting to final sale. In 1900 the yield was about 5,000 pounds and when the present area reaches full bearing the annual output should be more than 12,000 pounds.

The tea plant, though a native of a subtropical climate will succeed in tropical countries and some of the numerous varieties will even withstand frost. In South Carolina the plants have resisted a temperature of zero, but the yield was lessened for the next two years. This is the lowest recorded temperature in that locality during 150 years. Ample water, especially during the leaf-forming season, is essential. This is supplied in the East by copious rains but in the United States, where the rainfall is less than one half the Eastern annual average, the deficiency is made up by improved methods of tillage or by artificial irrigation or both. In the East the tea gardens are generally planted on high ground or slopes so as to permit the excess water to seep away; in America they are planted on rather low ground such as well drained pond-beds and swamps. Such lands are also naturally rich as a rule and therefore demand less initial application of fertilizers. After thorough preparation with plow and harrow the seeds or the plants are placed about 4 x 4 feet and given thorough, clean cultivation throughout the growing season to keep the weeds in check but more to keep the surface loose and open and thus conserve moisture in the soil. The first picking may be made during the third year when, as in after years, the plants may be visited when the new growth starts and later during the season as the axillary buds develop leaves. In the East the plants continue to yield well until the seventh year from seed when the leaves become scanty, hard, fibrous and of inferior quality. Then the bushes are cut down and new sprouts encouraged to develop from the bases of the old stems. The cutting down process is repeated as occasion seems to require until the plants are about thirty years old when new plantations are made. The early pickings are generally considered the best and the tenderest

leaves yield the finest qualities, several grades of tea being made from the various leaves of the succulent twigs, that is, a twig bearing four leaves may yield four grades of tea. This statement will give an idea of the enormous amount of hand work required in preparing the leaves for the final processes.

The flavors and odors of tea are due to the methods of manufacture and not to the original flavors or odors of the leaves. The same plant may be made to yield several grades of both green and black tea by grading and by processes of manufacture. In general, the green teas are made as follows: The leaves are roasted for about five minutes almost immediately after being gathered. During this process they give off much vapor, lose considerable weight and become flaccid. After being rolled between the hands, a method likely to be supplanted by Mr. Shepard's "rotary witherer," and other mechanical devices, the leaves are returned to the pans, kept heated and in constant motion until they are dry and the color has become "fixed." The process requires about an hour. Black teas are made somewhat differently. The leaves are spread in the air for a considerable time, then they are tossed until they become flaccid, before the brief roasting and the rolling processes mentioned. After the rolling they are again exposed to the air for several hours and then are dried over charcoal fires until the desired black tint is developed. Thus the methods of treatment induce the chemical changes which are noticeable in flavor, odor and color. There are, however, various modifications of these three qualities which are obtained otherwise. For instance, odor is frequently altered by the close contact of the tea to such odoriferous substances as the flowers of orange, jessamine and especially the fragrant olive (*Osmanthus fragrans,* better known in greenhouses as *Olea fragrans*): and color is altered, especially in green teas, by the addition in minute quantities of indigo and Prussian blue or other innocuous substances. It is untrue that copper is employed in any way for coloring tea.

The large number of plants whose leaves have been used as substitutes for tea may be grouped as resembling or not resembling the real plant in composition. The best known of the former are as follows: Maté, Paraguay tea, Jesuits' or St. Bartholomew's tea which is obtained from the leaves of a South American species of holly (*Ilex paraguayensis*). This is extensively used in various South American countries, especially in the Argentine Republic where the annual consumption is estimated at 13 pounds per capita, or about 27,000,000 pounds. Kola nut, coffee leaves and guarana are also used, but to a smaller extent. The principal substitutes unlike tea are probably Siberian tea (*Saxifraga crassifolia*), Chilean tea (*Eugenia ugni*), Appalachian tea (*Prinos glabra*), Trinidad tea (*Eugenia pimenta*), Labrador tea (*Ledum buxifolium*) and New Jersey tea (*Ceanothus americanus*). The last was used during the War of Independence and also during the War of the Rebellion. It is described as "a good substitute for indifferent black tea." The leaves of the partridge berry (*Mitchella repens*) are sometimes used in America.

In conservatories and greenhouses tea is often grown as ornamental plants and as objects of interest. The plants are managed like their close relatives, the camellias, but are probably less popular because they are more limited in their uses, especially because their flowers are more frequently axillary and hence less useful for cutting than those of the camellias.

Consult: Fortune, 'Tea Countries of China'; Johnson, 'Chemistry of Common Life,' and publications of the United States Department of Agriculture.

M. G. KAINS,
Crop Expert.

Tea Culture in the United States. In 1848 tea was successfully raised at Greenville, N. C., but the project was abandoned. Since 1860 various other experiments have been made in the Southern States. The oldest and best known tea farm in the United States is that of Dr. Charles H. Shepard, at Summerville, S. C., who has been experimenting with the tea plant for 15 years, and who has about 100 acres at Pinehurst set out to tea plants. During the season of 1902 the Pinehurst tea gardens produced more than 8,000 pounds of dry tea, almost doubling the crop of 1901. The average retail price of this tea is about $1 a pound. The United States Government has of late years contributed toward the experiment work being done at Pinehurst, and Dr. Shepard is a special agent of the department. The department has purchased some rare and expensive seed, and also some improved machinery for use at the plantation. The fact that there is no duty imposed on tea imported into the United States now makes it impossible for the Pinehurst gardens to compete with the low-priced teas. In the position which the United States takes in this matter it is almost alone among great nations. Great Britain imposes a tax of 12 cents a pound on tea, even if it comes from British colonies. In France the duty is more than 20 cents a pound. Dr. Shepard says that a duty of 12 to 15 cents a pound on foreign teas would enable the American planter to meet all competition in the home market on favorable terms. This, he says, would exclude from the United States most of the cheap teas and enhance the cost of a pure medium grade only about 1-25 of a cent per cup of the beverage.

Tea culture cannot be undertaken safely except where the temperature rarely goes lower than 25 degrees Fahrenheit and where a plentiful supply of water can be depended upon. In February of 1898, however, the mercury at Summerville went to one half a degree below zero and the plants survived, although it was necessary to prune them to the ground afterward. There was five inches of snow on the ground at the time, and plants covered by the snow suffered the least. Originally it was necessary to import all the seed. The Pinehurst gardens have tried seed from almost all available foreign gardens. Some of the most encouraging results have been obtained from seed brought from Ningpo, China, from a celebrated garden called Loong Tsin. The product of the Ningpo home garden is never exported. It sells for $2 a pound in China. This is not by any means an exorbitant price. There are teas which sell regularly in Japan and China for from $5 to $50 a pound. The tea seeds are planted in the fall and lie in the ground until the next spring. As the young plants are extremely sensitive to the sun it is necessary to erect a shelter over the nursery. At Pinehurst this is done by stretching coarse

wire netting over posts high enough so that a person can work under the net. The wire is then covered with pine needles, sacking or boards.

Tea-tree, a name applied not only to the *Thea* bushes (see TEA), but to various species of *Leptospermum* and *Melaleuca* — myrtaceous shrubs found from China to Australia, New Zealand and Tasmania. The tea-tree forms a common and almost impenetrable scrub of Victoria, in moist situations. It is a shrub of varying height and dark-green color, the branches bushy and growing perpendicularly, the leaves resembling the needles of a fir. The stems are straight, the wood hard, and valuable for many bush purposes. Several of the tea-trees belonging to the genus *Melaleuca* furnish the aromatic, pungent cajeput oil (see CAJEPUT) of commerce. It is especially obtained from *M. leucadendron*, a tree reaching 30 feet in height, with terminal spikes of white flowers, and elliptical to lanceolate leaves, from which the oil is distilled. It has a crooked trunk, papery bark, employed in packing, and yields a wood which is white, close-grained, hard and durable, even under the ground. *M. squarrosa* or swamp tea-tree has a thin bark, and the thin spongy cortex of *M. axillaris* can be used as a filter or blotting paper. The New Zealand tea-tree or tea-scrub is *Leptospermum scoparium*, a heather or juniper-like shrub with leathery foliage, like needles, and many small white blossoms. The common name is said to have been derived from the use of the foliage of this shrub and that of *L. lanigerum* by Captain Cook for tea, but the native name of the former is "ti." The white tea-tree is *L. ericoides*, of New Zealand. Other tea-trees are the bottle-green *Kunzea corifolia*, and the broad-leaved *Callistemon salignus* both of Australia and Tasmania; the Ceylon, *Elæodendron glaucum*, and the red scrub tea, *Rhodamnia trinervia*, several of which are myrtaceous and have hard, heavy close-grained wood.

Teach, or Thatch, Edward ("BLACKBEARD THE PIRATE"), American pirate: b. Bristol (?), England; d. on the James River, Va., 22 Nov. 1718. He is supposed to have gone out to the West Indies during the war of the Spanish succession, engaged as a privateer, and to have turned pirate in 1713 when the privateers refused to recognize the peace. He is first heard of in 1716 and from that time he cruised among the West Indies, along the Spanish Main, and the coasts of Virginia and Carolina, in his sloop, Queen Anne's Revenge, capturing numerous prizes and making his name a terror wherever known. In June 1718, his sloop was wrecked off North Carolina, and Thatch with some 30 of his men surrendered to the king's proclamation. He made an ally of the governor, Eden, who afterward countenanced his piracy in view of a certain share in the spoils, and for a time led a rollicking life, forcing the planters to supply his wants and exacting toll from all vessels which came up or down the river. The planters at length appealed to Colonel Alexander Spottiswood, lieutenant-governor of Virginia, who fitted out an expedition against the pirate, and on 22 Nov. 1718 the sloops moved up the river. Every man in the commander's boat was killed, and the captain, Robert Maynard, slew Thatch in a hand to hand struggle. His career is one of the most romantic in the history of American piracy, "Blackbeard the Pirate" being considered the ideal type of the pirate of fiction, and the interest which centres around him is second only to that in Captain Kidd. Consult his 'Life' in Charles' Johnson's 'Lives of the Pyrates' (1724).

Teachers' College, a school for the training of teachers, affiliated with Columbia University. For several years the College has maintained courses for teachers in the New York schools, and since 1897 has made these courses an integral part of the regular college courses. The continual increase in the number of teachers taking these courses led to the organization of an extension department in 1903 which includes the entire university system. For description of the courses offered at Teachers' College see COLLEGES FOR TEACHERS.

Teachers' Institutes. See TEACHERS, PROFESSIONAL TRAINING OF.

Teachers, Professional Training of. The idea of professional training of teachers is one of comparatively recent development. Formerly the teachers in colleges, the high grade academies, and other select schools were of course educated men; and many of the common school teachers were also college graduates, or undergraduates teaching during the vacations; while many others had received only an academic education. Yet there was no idea of professional training, nor of giving particular attention to the qualifications of any individual for teaching as a profession. The demand for better teachers was a marked feature of the great democratic movement toward popular education in the early part of the 19th century. The method of teaching that bears the names of Bell and Lancaster was highly mechanical and required considerable skill in its conductors; as a result of the spread of this system a model school was established in Philadelphia in 1818, without doubt the first training school for teachers in the United States; but its career was brief, as it did not outlive the movement of which it was a part. The first permanent schools for the professional training of teachers were established in Massachusetts in 1839–40. With the constant increase of this demand for better teachers, and the development of the idea that teaching is a profession which should rank with other professions, the agencies for the training of teachers have multiplied. They include normal schools and colleges, summer schools, university extension lectures, teachers' reading circles, teachers' training classes, chairs of education in colleges and universities, and teachers' colleges.

Normal Schools.—The first normal schools, as has been said, were established in 1839–40 at Lexington, Barrie, and Bridgewater, Mass. These schools had at first both private and public support, individuals and the State legislature sharing in founding them; they were an experiment and the legislature would not bind itself to support them for more than three years; they were finally, however, incorporated into the State system of education; and the number of normal schools in the State increased. The northern and central States also generally adopted the normal school system; and in the West the normal schools grew with other educational institutions. In the South all normal schools have been established since the Civil War, but now hold a recognized place in the educational systems of the Southern States

New York was the second State to establish a normal school, at Albany in 1844; Michigan established the first normal school west of the Alleghanies. The dates of the founding of other leading schools are as follows:

New Britain, Conn., 1850.	Winona, Minn., 1864.
Boston, Mass., 1852.	Chicago (Cook county), Ill., 1867.
Normal, Ill., 1857.	Plattville, Wis., 1866.
Millersville, Pa., 1859.	Nashville, Tenn., 1875.
Oswego, N. Y., 1860.	Cedar Falls, Iowa, 1876.
Emporia, Kan., 1864.	Terre Haute, Ind., 1870.
Framington, Me., 1864.	

The ordinary courses in the State normal schools include history and theory of education, school organization, school discipline, psychology and child study, and methods of teaching the ordinary subjects of the school curriculum; practice work in a model or training school is also a part of the work. School hygiene and ethics have been added to some curriculums. The length of the courses varies, mostly from two to four years; some schools have only a one year's course, while some have a five years' course. In the longer courses work of an academic character in addition to the professional work is usually included; and many of the best schools in their best courses give nearly the equivalent of the first two years of college work. Special courses for college graduates are frequently offered, intended to give in one year a professional training for teaching; and advanced courses for normal graduates are almost universally provided. The requirement for admission to normal schools in Massachusetts is graduation from an approved high school, or equivalent education; the usual standard of admission in other States is not so high. On the whole, there has been a growing tendency to raise the standards of admission and to strengthen and diversify the courses of study. Some normal schools, assuming higher functions, have also taken the name of college. Prominent among these is the New York State Normal College at Albany, which is the successor of the school founded in 1844. It offers two courses, the English and the classical, both including instruction in methods and professional subjects only. Graduates in either course are entitled to life State certificates. Other normal colleges are the Michigan State Normal College, which confers the degree of bachelor of pedagogics on those who complete the four years' course, and the Normal College of the City of New York. The cities have also established normal schools, generally called training schools, for the education of local teachers; nearly all the large cities, and many smaller cities have their own independent schools. In 1895 the New York legislature passed a law empowering cities and villages employing superintendents of schools to establish training schools which are aided by State funds, and have a uniform course of study. Private enterprise has also established and maintained a large number of normal schools. The United States Education Report of 1902 gives 109 private normal schools, and 175 public normal schools, the private schools having 15,665 students, the public schools 40,403.

Training Classes and Courses in Schools and Colleges.—In the high schools it is in some places the custom to make a course in the history and theory of education an elective for those desiring to become teachers; the more common custom is to organize training classes for graduates of the high school who wish to take professional training for teaching; these classes are much like the city training school, but are not so far developed and form a post-graduate department of the high school instead of a separate institution. The demand for the improved training of teachers soon affected the colleges and universities and led to the establishment of courses and professorships of education. President Wayland sought to establish a course in the science of teaching at Brown as early as 1850, but his new system of which this course was a part was not successful; an elective course in the theory and practice of teaching was made a part of the curriculum at Antioch College, Ohio, in 1853. The first university to establish a permanent professorship in education was the University of Michigan, which established a chair of the science and art of teaching in 1879. This has since grown into a separate department offering 10 courses. Along this line of development the State universities have been the leaders. These teachers' courses include generally history and theory of education and educational psychology or child study; other courses often given are school organization and supervision, the science and art of teaching and sometimes special teachers' courses in different departments of study, the languages, mathematics, history, etc. The United States Education report for 1902 reports 375 colleges and universities with teachers' training courses. Of these the State Universities of Arkansas, California, Colorado, Indiana, Iowa, Kansas, Michigan, Minnesota, Mississippi, Missouri, Tennessee, Texas, Utah, West Virginia, and Wisconsin, South Carolina College, and Ohio University, and Brown, Columbia, Cornell, Leland Stanford, Jr., and Northwestern universities, and Randolph Macon Woman's College have separate departments of pedagogy. A further development of this movement has been the establishment of the teachers' colleges, affiliated with some university. See COLLEGES FOR TEACHERS.

Teachers' Institutes.—The institute is a meeting of those engaged in the work of teaching, for a wider study of subjects of the school curriculum and of the methods of school organization, discipline, etc. Important also are the lectures and other exercises of the institute that deal with historical, literary, and scientific subjects. At first the institute was a purely voluntary agency. There were no funds for its support, save such as the teachers attending and public-spirited citizens supplied. Massachusetts first appropriated money for institutes in 1846; New York and Ohio, in 1847; Pennsylvania, in 1855. In course of time the institution was firmly imbedded in state school laws, and at present most of the States, if not all of them, give it some legal recognition and financial support. In 1867 Pennsylvania passed a law requiring acting teachers to attend their respective institutes; a similar provision is in force in New York State. The institutes are held at all seasons of the year; in cases where attendance is compulsory the local authorities are required to close the schools if the institute is held during the school term. Institutes are of numerous types, presenting such divergencies that it is difficult to define the species. There are state institutes and

county institutes; district, city, and town institutes. However, the best known type takes its name from the county, which is the civil division that, as a rule, furnishes the best unit of organization and management. This type alone presents many varying features. Some county institutes continue but a day or two; some, several weeks. Some are conducted by state authorities, as the superintendent of public instruction or his assistants; some by local authorities, as county superintendents, or officers of teachers' institute associations. Some are carried on much like a school, with text-books, set lessons, and recitations, together with lectures; some depend upon lectures alone. Some are graded with a view to securing instruction especially adapted to the different classes of teachers; others are wholly unclassified and the attendants all receive the same instruction. Sometimes two or more counties are thrown together in one district, it may be for a year only, in order to secure, through the concentration of funds and influence, a longer term and better advantages. State institutes, which are infrequent, commonly look more to the needs and interests of the better teachers of the State. City institutes are conducted with special reference to local needs. A private institute of importance has been established by the Catholics under the name of the National Catholic Teachers' Institute. National meetings are not held, but local institutes are organized for the benefit of the teaching orders. The work was begun in 1895 under the auspices of the Paulist Fathers in New York.

Teachers' Reading Circles.— The teachers' reading circle movement originated in Ohio where it was fully established in 1883. It is designed to furnish a course of reading partly professional, partly general, under the direction of the State Teachers' Association in each State. It is usual for the State associations to appoint a special board to plan a course of reading from year to year, to select the books, and provide examinations on the courses. In connection with this work local classes or circles are formed for carrying on the course. The efficiency of this work naturally varies widely in different States, but is generally conceded to have done much good in arousing interest in the better culture of teachers and in organizing courses of reading.

Summer Schools and University Extension. — Neither of these educational agencies was designed solely for teachers, but they have been so largely taken advantage of by teachers for the improvement of their professional work that they may fairly be included among the means of training teachers. Among summer schools, though the majority are general in character often including pedagogical courses in their curriculum, some are established especially for teachers and offer mostly professional courses, courses in methods, etc., though including also academic subjects. (See SUMMER SCHOOLS; SUMMER SCHOOL OF THE SOUTH; etc.) The university extension lectures as a rule take no account of teachers as teachers; but teachers are generally prominent on local committees and in classes, and sometimes pedagogical courses are included in extension programmes. See UNIVERSITY EXTENSION; STUDY OF EDUCATION.

Teaching of the Twelve Apostles, a part of the Apostolic Constitutions (q.v.) enunciating principles of Christian faith and practice. It was first (1873) discovered by Bryennius, metropolitan of Nicomedia, in a manuscript of the 11th century, and was published in 1875; since which it has been the occasion of much discussion. Consult: Harnack, 'Texte und Untersuchungen zur Altchristlichen Litteratur' (1886); Schaff, 'The Teaching of the Twelve Apostles' (1885).

Teak, a large, verbenaceous forest tree (*Tectona grandis*), native to southern Asia, and to the Malayan Islands, which furnishes the valuable lumber known also as teak. The heartwood is golden-brown in hue, when first cut, but when aged darkens to the tint of black walnut. It is very durable, examples in housetimbers having already survived for hundreds of years, is straight in grain and easily worked. It takes a high polish, and if properly seasoned will not warp or split. Teak is used for house-building, furniture, and wood-carving, and is one of the most valuable woods for ship-building, especially for decking and for backing the metal plates of iron-clads, since it contains a resinous oil, which prevents it from corroding iron; it is also in demand for car-wheels, gun-carriages, railway ties and engineering works. Although the natural supply of teak, throughout its range, was great, as it occurred in mixed forests, most luxuriantly in Burma, and adjacent regions, it was rapidly disappearing on account of the unceasing demand and lack of re-planting. Great Britain has checked this waste by efficient protection and forest-administration in its Indian and Burmese dominions. The timber is mostly consumed in India. The tree is not usually found in pure forests, but mixed with bamboo, which it overtops, and which seems necessary for its growth. It requires a light soil with good sub-drainage. The leaves, which are nearly 10 inches long, and resemble those of the tobacco, are somewhat drooping and coriaceous, and appear as soon as the rainy season opens. They yield a red dye. Teak trees may easily be distinguished for some time during the rains, by their broad terminal panicles of flowers, which are small, white and fragrant, on slender branchlets. The seeds are oily, in a hard nut covered with a felt of matted hairs, and further enclosed in an enlarged membranous calyx. These feathery panicles render the tree again conspicuous during the dry season, when it is leafless. The seeds are plentiful, and would soon restore the forests, were it not for the forest-fires, raging just about the time when the nuts are falling. Many of the seeds, however, are washed down by the first heavy rains of the monsoon, into the valleys, where the trees are principally found. Although many logs of teak have cracks or hollows running up through the centre from the butt, that are probably caused by the fires, the market value of the teak, which is greater than that of any other wood except mahogany, depends upon the regular cylindrical shape of the log. This should be without knots or other irregularities, and great care is taken in the plantations to rid the trees of creepers which, by their clinging habit, distort the trunks. Teak trees may reach a height of from 100 to 150 feet and a circumference of from 20 to 25 feet; to attain the latter girth, a tree grown under natural conditions must have lived at least 100 years. In

the plantations growth is quicker. To get these great logs out of the Burmese forests to the coast it is necessary to raft them down the rivers, but, since green teak will not float, and if felled to dry on the ground, the result is uneven seasoning, and the lumber still does not float readily, the old Burmese method of drying the wood when standing is still the best available. This is done by girdling, a broad annular strip of bark and sapwood, is taken off, completely encircling the trunk, and the cuts striking down quite into the heart wood. The supply of sap of the upper portion of the tree is of course entirely cut off, and the tree dies above the girdle. It stands in that condition for two or three years, according to its size, seasoning evenly and completely, being exposed to the weather on all sides. The logs will then float easily, and are sent down the water-ways, sometimes one by one, until they reach a river large enough for them to be formed into a raft. When they reach the lumber yards, elephants are often employed to move the teak about, and stack up the logs.

Teal, a small fresh-water wild duck of the genus *Querquedula, Nettion,* or some closely related genus, many species of which occur in various parts of the world. The three North American species are the blue-winged (*Q. discors*), the cinnamon (*Q. cyanoptera*), and the green-winged (*Nettion carolinensis*). The first and last are of common occurrence all over the continent and breed in suitable places throughout the northern United States and Canada. The males are noted for their brilliance of plumage, as compared with the sober dress of the little females; hence almost any small and gaudy duck is likely to be called a teal in the books of unscientific sportsmen and travelers.

Tears. See Eye.

Tears of Saint Lawrence. See Meteors.

Tea'sel, any member of the genus *Dipsacus,* botanically not far removed from the campanulas. They are tall, rough, hairy or prickly herbs, the most important species being the fuller's teasel (*D. fullonum*), a stout, biennial, with sessile, lanceolate to pinnatifid leaves, which are opposite and often connate. The pale-lilac, tubular flowers are gathered into dense, terminal, oblong heads, subtended by an involucre, and many-bracted. The flowers open, a few at a time, in horizontal zones. Both bracts and involucre are rigid and tipped with spines the latter being hooked and remaining in fruit. They are then brown and thickly set, radiating from every side of the head, become cylindrical, and are very suitable for raising the nap upon woolen cloths, or "teazing" them. The heads are fixed for this purpose around the circumference of a broad wheel, or on flat cards. This teasel is cultivated, and is suspected to be only a variety of the wild *D. sylvestris,* which differs chiefly in the spines of the bracts, which are straight.

Teche, tĕsh, Bayou, in the southern part of Louisiana, a small tide-water channel, west of Grand Lake, which flows generally south by east into Atchafalaya Bay. It was once the outlet, or the main channel, by which the Red River discharged its waters into the Gulf of Mexico. The land through which the Bayou Teche now flows has been formed from the sediment brought down by the rivers and by the overflows. It contains some of the richest soils of the State. On it are raised large quantities of cotton, sugar-cane, and rice. The Teche is navigable to Saint Martinsville, about 100 miles, and above that point for small boats, when there is high water.

Technical Education. Technical education in the United States was first made possible by the munificence of a private citizen — Stephen Van Rensselaer — who, at the time, was interested in a canal project to connect the Hudson River with the Great Lakes. He had caused a geological survey to be made; and one of the results of this effort was to demonstrate the country's need of technically trained men. Out of this need, supplemented by his generous wisdom, in 1824 the famous Rensselaer Polytechnic Institute (q.v.), Troy, N. Y., came into existence. It was the first school of engineering to be established in an English-speaking land, and it met a boundless opportunity. The work of this school embraces civil, mechanical, and electrical engineering and railroad construction. Among its graduates are numbered 60 presidents; 185 vice-presidents, managers, and superintendents; and 100 chief engineers of railroad companies, steel and iron works, bridge companies, waterworks, electrical companies, mining companies, sewerage systems, canals, etc. About 1846 the universities took up the matter of technical education, and the Sheffield Scientific School (q.v.) was founded at Yale in 1847. This institution is devoted to instruction and researches in mathematical, physical, and natural sciences, with special reference to the promotion and diffusion of scientific intelligence. In 1847 the Lawrence Scientific School (q.v.) was founded by the corporation and overseers of Harvard University, and it was opened to students in 1848. "The esssential peculiarity of this school is that the instruction provided for its students is arranged in groups of definitely required programmes of four-year courses which are intended to afford the training necessary for one of the scientific professions — engineering, mining, architecture, chemistry, biology, geology, etc." At first the Sheffield and Lawrence Schools were more devoted to science than to technical training, though they have now partaken more of the character of schools of engineering. The Chandler Scientific School at Dartmouth College was founded in 1852. The work of the technical schools associated with the universities and colleges has been of excellent character, and their graduates have taken high rank among professional men.

In the United States, technical education received its strongest impetus in the passing of the Morrell Act in 1862, by which large land grants were given to the States for the founding of colleges of agriculture and mechanical arts. Institutions founded under this act have received from the Federal Government in the aggregate more than $16,000,000. Probably not more than half of these institutions have special courses in the various branches of engineering — the government aid having been utilized to a great extent in the promotion of agricultural education. Among the more prominent of these State institutions noted for the excellence of their technical courses, may be mentioned Purdue University, Lafayette, Ind.; Cornell University, Ithaca, N. Y., and the State Universities of Ohio, Wisconsin, Illinois, Michigan, and California. In all

courses of study in these institutions, the instruction is both theoretical and practical. "The usual method of text-book recitation is employed; but the student is also required to put into practice, as far as possible, the instruction that he receives. The student in mechanical engineering not only studies the theory of the construction and operation of machinery, but in the drawing room and the shop, he also designs, builds, and operates machines. In civil engineering the class-room is supplemented by field work and by the designing of bridges, railways, waterworks, etc." In electrical engineering, a large amount of laboratory practice in the measuring and manipulating of electric currents, as well as the designing and testing of machinery accompanies the studies of the class-room. The combination of the practical and theoretical characterizes all the courses of these institutions. As stated, the institutions not having State aid were led from the first by the Rensselaer Polytechnic Institute established in 1824. This pioneer work has been nobly succeeded by larger endowments. The foundation of the Massachusetts Institute of Technology was laid in a memorial prepared by Prof. William Barton Rogers and presented to the legislature of the commonwealth in 1860. A deserved eminence has always belonged to this educational enterprise. In the memorial the proposed school was described as a "Polytechnic College furnishing a complete system of industrial education, supplementary to the general training of other institutions, and fitted to equip its students with every scientific and technical principle applied to the industrial pursuits of the age." The Civil War led to the postponement of the opening of the School of Industrial Science, but the Society of Arts began its meetings in December 1862. The regular courses of instruction in the School of Industrial Science began in October 1865. At the close of the Civil War, the importance and value of technical education had been fully demonstrated. The attention of the country was drawn to its significance, and public-spirited citizens gave of their wealth to found endowed technical schools. The Worcester Polytechnic Institute, Worcester, Mass., was founded by John Boynton, and was opened for the reception of students in 1868. This institution offered courses designed to meet the wants of those who wished to become mechanical, civil, or electrical engineers, or chemists. Recognizing the use of workshops as furnishing a highly important part of the students' training, the Worcester Polytechnic Institute was the first technical school to add such shops to its equipment. In 1865 Asa Packer gave a large bequest to establish an educational institution in the Lehigh Valley. On this foundation rose Lehigh University, an institution providing courses in civil, mechanical, metallurgical, mining, electrical, and chemical engineering, and all needful collateral studies. Edward A. Stevens, in his will bearing date 15 April 1867, bequeathed a block of land and a large sum of money for the founding of an educational institution. From this bequest rose the Stevens Institute of Technology at Hoboken, N. J. The plan of the instruction pursued is such as will best fit young men of ability for positions of usefulness in the branches of mechanical engineering and other scientific pursuits. The Rose Polytechnic Institute, Terre Haute, Ind., was opened in 1883. Since then many institutions of like character have been established. Pratt Institute in Brooklyn was founded in 1887, after many years of investigation of the subject of technical education by its founder, Charles Pratt. Drexel Institute, Philadelphia, Pa., was founded by J. Drexel in 1891 for the promotion of education, art, science, and industry. The Case School of Applied Science was opened in Cleveland, Ohio, in 1881. Armour Institute of Technology, Chicago, was founded by Philip D. Armour in 1892, and instruction began in the following year. The courses taught are civil, mechanical, electrical, chemical, fire protection, gas engineering, architecture, and all needful collateral studies. Both the Case School and the Armour Institute of Technology have very extensive workshops. A similar endowment and wise management have given the Lewis Institute, Chicago, a wide and valued influence. All these schools belong to the class of institutions that have had their origin in private endowment. The Massachusetts Institute of Technology receives a share of the Congressional aid to Land-grant colleges. The courses of study in the technical colleges throughout the United States extend over four years. Requirements for admission are much the same as for other institutions of college rank. In recent years, technical education by correspondence has come rapidly into prominence, meeting a need in the industrial world not touched by resident schools. Its practical results have long been recognized by both employers and by workmen. Several such correspondence schools are successfully conducted as private corporations. This service of correspondence instruction to the man otherwise unable to obtain technical training, is so great as to make any effort toward the broadening and enriching of this work very commendable. See TRADE SCHOOLS.

FRANK W. GUNSAULUS,
Armour Institute of Technology.

Technology, Schools of. Schools of technology in the United States are of comparatively recent date. The earliest was the Rensselaer Polytechnic Institute of Troy, N. Y. (q.v.), founded in 1824; then followed the Massachusetts Institute of Technology, Boston, Mass., 1861; the Worcester Polytechnic Institute, Worcester, Mass., 1868; Lehigh University, 1866; Stevens Institute of Technology, 1871; and the Case School of Applied Science, in 1880 (qq.v.). From that time on the number has increased rapidly. There are at present 43 institutions in the United States classed as schools of technology by the Commissioner of Education. Among these are privately endowed institutions, like the Stevens Institute of Technology; State institutions, like the Sibley College of Cornell University; scientific departments of older universities, and schools partly industrial, like the Pratt and the Armour Institutes.

Technical schools in Germany are graded as (1) elementary industrial schools; (2) secondary industrial schools; (3) higher polytechnic institutes. There is no such systematic grading in the United States. "The tendency is toward providing all needed forms of education, including more or less technical training, in connection with a university. Many of the State colleges are affording in one institution the whole range of pure and applied science." The

requirements for entrance to most of the technical schools of the United States are algebra, plane geometry, English literature, the history of the United States, French, or German, and a knowledge of the common English branches. Some schools require solid geometry, plane trigonometry, elementary physics, and chemistry, and some require Latin, in addition to the above. The general courses of study pursued are civil engineering, mechanical engineering, electrical engineering, mining engineering, architecture, and chemistry. The length of each course is usually four years. Marine engineering forms an additional course in the University of Maine, University of Michigan, Cornell, Columbia, and New York Universities. Sanitary engineering is offered as a course in eleven schools, but in only two at present, are students reported as enrolled. Naval architecture is offered as a course in the Massachusetts Institute of Technology, in Columbia, New York, and Cornell Universities, and in the University of Michigan. Railway engineering is offered as a course in Yale, Cornell, and Columbia Universities, and in the Universities of Illinois and Minnesota. Schools of forestry are connected with Yale, Michigan, Cornell Universities; with the University of Nebraska, and the Ohio State University. Horticulture is taught in Harvard University, Ohio State University, Iowa State College, and University of Nebraska. Domestic art, domestic science, and the fine arts, in addition to steam and machine design, and applied electricity, are given prominence in Pratt Institute, Brooklyn, N. Y. At the Armour Institute, Chicago, Ill., type-writing, music, and domestic art are added to the usual engineering courses. The two latter schools are of an individual type.

Schools of Agriculture and Mechanic Arts.— The pioneers of technical education in the United States were the privately endowed schools of technology, but technical education received its greatest impulse by the "Land Grant Act" and "Morrill Bill" of Congress from the year 1862 to 1890. (See COLLEGES, LAND GRANT.) Under these acts the Federal Government has given 13,000,000 acres of public lands for the establishment and maintenance of colleges of agriculture and mechanic arts. The name has not always been retained; as acts of State legislatures, and private benefactions and other causes have led to a change, or to an affiliation with State institutions. But as a result, at least one such institution has been established, and is now in operation in each State and Territory of the United States, except Alaska. Of the 65 institutions that have been organized under these Acts, 27 are colleges of agriculture and mechanic arts, and 19 are universities having departments of agriculture and engineering. Separate institutions for colored students have been established in eight Southern States, leaving 11 unclassified. The courses of study pursued in these schools are agriculture, civil engineering, electrical engineering, chemistry, mining engineering, textile engineering (in North Carolina and Mississippi); forestry (in Michigan); and horticulture (in Washington and Virginia). Clemson Agricultural College, in South Carolina, has a full equipment of cotton machinery for illustrating the manufacture of yarn and woven fabrics. Requirements for entrance vary greatly in different States. The average standard, as recommended by a committee in 1896 was as follows: Physical geography, United States history, arithmetic, algebra, as far as quadratics, English grammar and composition, plane geometry, one foreign language, one natural science, ancient, general, or English history. While there are some institutions which have not come up to this standard of admission, there are others whose standard is much higher, requiring a preparation comparable with that of admission to the highest literary, or scientific universities.

General Statistics.— The number of technical students in the United States in 1902 was about 30,000, divided as follows: Students in mechanical engineering, 6,363; in civil engineering, 4,734; in electrical engineering, 3,293; in mining engineering, 1,837; in chemistry, 858; in agriculture, 3,472; in architecture, 358; in sanitary engineering, 30; in the study of general sciences, 7,393. Women are reported as attending 27 out of 43 schools of technology. Number of women, 2,462. Number of men, 16,984. The following is the list of schools of technology in the United States in this same year: Alabama Polytechnic Institute; Colorado Agricultural College; Colorado State School of Mines; Connecticut Agricultural College; Georgia School of Technology; Armour Institute of Technology; Purdue University; Rose Polytechnic Institute; Iowa College of Agriculture and Mechanic Arts; Kansas State Agriculture College; United States Naval Academy; Massachusetts Agricultural College; Massachusetts Institute of Technology; Worcester Polytechnic School; Michigan Agricultural College; Michigan College of Mines; Mississippi Agricultural and Mechanical College; Montana College of Agriculture and Mechanic Arts; Montana State School of Mines; New Hampshire College of Agriculture and Mechanic Arts; Stevens Institute of Technology; New Mexico College of Agriculture and Mechanic Arts; New Mexico School of Mines; Clarkson School of Technology; Rensselaer Polytechnic Institute; United States Military Academy; Agricultural and Mechanical College for the Colored Race; North Carolina College of Agriculture and Mechanic Arts; North Dakota Agricultural College; Case School of Applied Science; Oklahoma Agricultural and Mechanical College; Oregon State Agricultural College; Rhode Island College of Agriculture and Mechanic Arts; South Carolina Military Academy; Clemson Agricultural College; South Dakota Agricultural College; South Dakota State School of Mines; Texas Agricultural and Mechanical College; Utah Agricultural College; Virginia Agricultural and Mechanical College; Virginia Military Institute; Washington Agricultural College. This list, which is reported by the commissioner of education of the United States, does not include a number of schools affiliated with institutions of broader scope, and which are properly described above, as schools of technology; nor those which combine industrial with technical training, which latter will be found under another classification. For detailed information regarding technical education in the United States, consult Articles in this encyclopedia: EDUCATION ENGINEERING; MANUAL TRAINING; TECHNICAL EDUCATION; TRADE SCHOOLS; and also 'Annual Report of the United States Commissioner of Education'; 'Report of the United

States Commissioner of Labor on Trade and Technical Education'; 'Annual Reports of the Society of Mechanical Engineers.' See TRADE SCHOOLS.

JOHN R. PADDOCK,
Member American Assn. for Advancement of Science.

Tecumseh, tĕ-kŭm'sĕ, Shawnee chief: b. near Springfield, Ohio, about 1768; d. 5 Oct. 1813. About 1805 he formed the design of uniting the tribes of Western Indians against the whites. He claimed that the land-treaties between individual tribes and the settlers were void, inasmuch as the land was the common property of all the tribes and could be alienated only by unanimous assent. British agents fanned the dissatisfaction, which was likewise increased by the ejectment of Indians by speculators. Gen. W. H. Harrison (q.v.) warned him to discontinue his scheme, and held a parley with him without result near Vincennes, Ind. He was aided in his plans by a brother, Tenskwatawa, who was reverenced by the Indians as a prophet. Tenskwatawa directed the attack at Tippecanoe (q.v.) 4 Nov. 1811, though he remained on a hill during its progress. Tecumseh was not present. He incited the Creeks in their futile revolt, joined the British, was made a brigadier-general, led 2,000 Indians at the siege of Fort Meigs, commanded the right wing at the Thames, and was killed there. He possessed great qualities of leadership. Consult Drake, 'Life of Tecumseh.'

Tecumseh, Mich., village in Lenawee County; on the Raisin River, and on the L. S. & M. S., and the C. J. & M. R.R.'s; about 30 miles southeast of Jackson and 12 miles northeast of Adrian. It is in an agricultural region noted for its fruit, especially peaches. The chief manufactures are flour, furniture, wagons, carriages, brick, tile, paper, lumber, foundry and machine-shop products, and dairy products. It has a high school, graded schools, and a public library. The two state banks have a combined capital of $70,000. Pop. (1890) 2,310; (1900) 2,400.

Tecumseh, Neb., city, county-seat of Johnson County; on the Big Nemaha River, and on the Burlington and Missouri River Railroad; about 50 miles southeast of Lincoln and 60 miles south of Omaha. It is in a rich agricultural region. It is the commercial centre of a large portion of the county; the chief shipments are grain, live stock, vegetables, and fruit. The city has eight churches, a high school, four public school buildings, and a public library. There are two banks, a national and a state, with a combined capital of $100,000. Pop. (1890) 1,654; (1900) 2,005.

Tees, tēz, a river in northern England, which rises east of Cross Fell (q.v.) forming along its entire course the boundary between Durham and the North Riding of Yorkshire, passes by Barnard Castle, becomes navigable between Dalton and Yarm, and, after flowing a distance of 70 miles, empties into the North Sea near Stockton, forming the Tees Bay.

Teeth, hard structures developed in the mouth and adjacent parts of vertebrated animals, and concerned in the obtaining and mastication of food and secondarily in a variety of other functions. "They present," says Owen, "many varieties as to number, size, form, structure, position, and mode of attachment, but are principally adapted for seizing, tearing, dividing, pounding, or grinding the food. In some species they are modified to serve as formidable weapons of offense and defense; in others, as aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for transport and working of building materials. They are characteristic of age and sex; and in man they have secondary relations, subservient to beauty and to speech. Teeth are always intimately related to the food and habits of the animal, and are therefore highly interesting to the physiologist; they form, for the same reason, important guides to the naturalist in the classification of animals." For further information as to the development of the varied forms of teeth in relation to use, see KINETOGENESIS.

Teeth are a production of skin, and homologous with the scales of fishes, and various other hardenings of the surface; in some of the fishes and lower invertebrates there is an insensible gradation from one to the other. In one large class, the birds (q.v.), they are now wholly absent, their functions being performed by the horny covering of the jaws (bill) or by the gizzard, or both; but in the earliest extinct birds they were present in both jaws, and had a close resemblance to those of reptiles. Turtles, also, and many amphibians are toothless; and in some of the inferior mammals teeth are present only as embryonic rudiments, which disappear before or soon after birth. Many small, sharp hardened structures in the worms, echinoderms, mollusks, insects, and other invertebrate animals, which are more or less concerned in biting, are popularly spoken of as teeth, but, strictly speaking, should be otherwise designated. In general the present article will treat of the teeth as found in the mouth of man and the higher vertebrates, where they arise from the gum or covering of the jaw-bones, each rooted in a socket or sockets of its own formed by the alveolar processes of the maxillary bone.

Structure of Teeth.— A tooth begins, early in embryonic life, by the development from the mucous membrane of the gum of a group of modified epithelial cells which dip down into the substance of the gum and form an organ, the germ of the tooth, which will furnish the enamel needed. Below that there next develops a mass of special tissue which takes the shape of the future tooth. In due time it begins to calcify upon the surface, and this process proceeds, downward and inward, until all of the substance of the papilla has been changed into solid dentine except a central cavity which remains filled with growing tissue (pulp), supplied with blood and nerves. This dentine is the principal constituent of the greater number of teeth, and is seen to best advantage in the massive ivory of the tusks of the elephant and walrus, and consists of an organic basis richly impregnated with mineral (chiefly phosphate of lime) disposed in the form of minute tubes, each open at its inner end and occupied by a fibril of living nutritive tissue connected with the pulp. In the ordinary case, these dentinal tubes radiate from the pulp cavity in a slightly wavy course to the outer surface. "The hard substance of the tooth is thus arranged in hollow columns, perpendicular to the plane of pressure, and a certain elasticity results from these curves; they are upright where the grinding surface of the crown receives the appulse of the opposing tooth, and are horizontal where they have to resist the

pressure of contiguous teeth. The tubuli also receive the plasma transuded from the remains of the vascular pulp, which circulates by anastomosing branches of the tubuli through the dentine, maintaining a sufficient though languid vitality of the system. The delicate nerve branches on the pulp's surface convey sensations of impressions affecting the dentine — sensations of which every one has experienced the acuteness when decay has affected the dentine, or when mechanical or chemical stimuli have "set the teeth on edge." When a part of the primitive vascular pulp from which the dentine is developed remains permanently uncalcified, red blood is carried by "vascular canals" into the substance of the tissue. Such dentine is called vaso-dentine, and is often combined with true dentine in the same tooth, as, for example, in the large incisors of certain rodents, the tusks of the elephant, and the molars of the extinct megatherium. When the cellular basis is arranged in concentric layers around the vascular canals, and contains "radiated cells," like those of bone, this is termed osteo-dentine, and resembles true bone very closely.

While this dentine is developing the tissue around the tooth-germ is forming a capsule or wall called the tooth-sac, the inner layer of which ossifies, forming a bony coat, the crusta petrosa or cement, on the external surface of the tooth. It is often found only as a thin layer on the surface of the root, which develops downward as the tooth grows, forcing the tooth upward, through and above the gum; but sometimes, as in the molar teeth of the horse, elephant, and mastodon, it is a structure which plays a very important part covering and filling in the interstices between the folds of the enamel. It is much like true bone in its constitution. Meanwhile the epithelial cells of the superficial layer of the skin over the tooth-germ are depositing upon the dentine of the upper part of the tooth, which is to be exposed, an extremely hard bluish white, translucent, protective layer, composed of about 96 per cent of mineral matter, called the enamel, and destined to resist the wear to which teeth are subjected in their work. It is the hardest organic substance known.

Teeth are of various forms, but reducible to two types, of which the simpler and more primitive is represented on a large scale by the tusk (incisor) of the elephant or beaver, in which the pulp retains its conical form and activity, or is "persistent," and continues to supply dentine at the base of the tooth, which thus grows throughout life to compensate for its wearing away at the tip. These teeth are said to be "rootless." The other type, exemplified in man, is called "rooted," and in this case, after the "crown," or exposed part of the tooth has been fully formed, the pulp within the "neck," or that part just beneath the surface of the gum, begins to fill with dentine, and to form a downward growing pointed mass, the "root" or "fang," which at last is solid except for a narrow central canal in which the contracted remainder of the pulp persists, largely supplied with nervous filaments from the pair of cranial nerves. Various intermediate conditions between these two types exist.

In form teeth vary from a simple spine-like or conical shape, to many chisel-like or massive and complicated forms, all of which are determined in the germ, and before the tooth makes its appearance above the gum or is "cut," which in mammals never normally occurs before birth. This appearance in some, as the seals, may take place all at once; but in most cases occurs at intervals, the front teeth usually showing before the back ones, which sometimes are not cut (for example, the "wisdom teeth" in man) until several years later. In man and higher mammals two sets of teeth are developed: the early, *milk*, or *deciduous* teeth, and the permanent set. Such forms are therefore named *diphyodont;* while those in which one set only is developed are named *monophyodont*. When more than one set occurs those of the second are developed in precisely the same place and manner as the first, except as to certain details of the enamel germs. The milk or temporary teeth are gradually displaced from below by the upward growth of the permanent teeth, the fangs of the milk-teeth being absorbed, and the latter falling out as their successors are more fully developed. This arrangement is adaptive to the growth of the animal's jaws, among other advantages. The milk set in man consists of 20 teeth; and numbers four incisors, two canines, and four premolars or bicuspids in each jaw. The permanent set includes, in addition to the foregoing teeth, six true molars in each jaw — the latter being thus unrepresented in the milk set. The milk-teeth begin to appear about the sixth month of life, and continue to be developed till about the end of the second year. The permanent teeth begin to appear about the sixth year of life, the first being the front molar of each side, while the last molars or wisdom-teeth are not usually developed until adult life has been attained. Man has thus 32 teeth in his permanent set — 16 in each jaw.

The incisors or front teeth are single-fanged, and have chisel-shaped crowns, suitable for biting. To the incisors succeeds on each side the single canine tooth, which has also a single root and a more pointed crown. This is a piercing, holding or tearing instrument, most highly developed in the dog (*canis*) and other beasts of prey. The fourth and fifth teeth premolars or bicuspids, derive their latter name from the presence of two pointed cusps or tubercles on their crowns. The fourth tooth, or first premolar, shows a tendency to become double-fanged, while the fifth, or second premolar, is double-rooted, and the crowns of both are broad. The molars — three on each side of each jaw — have the broadest crowns of all, and possess each two or three fangs, each growing from a separate pulp and rooted in its own socket. The sixth upper molar is the largest tooth of the whole set. These massive teeth crush or grind the food, and vary greatly in the character of the surface of the crown according to the nature of the food. Thus in the insectivorous mammals, as the shrews, the crowns are covered with numerous sharp edges and points which, working against one another, like shears, as the lower and upper molars are closed together in chewing, cut up the hard shells of insects into little pieces fit for swallowing and digestion. Such a type of crown is called *secodont*. Another type, the *bunodont*, is seen in the molars of omnivorous animals, such as man, monkeys, pigs, etc., where the surface of the crown is broad, flat-

tened, and elevated into rounded tubercles. In the herbivores the crown is crossed by parallel ridges, which are greatly varied and complicated, up to the huge molars of the elephant family; in these cases the ridges are formed by partition-like infoldings of the enamel and the interspaces are filled with cement. When such a tooth wears away at the surface, the different density of the layers of the substances of which it is composed — enamel, cement and dentine — causes them to wear unequally, the hard enamel ridges projecting beyond the others and thus, as Flower says, "giving rise to a grinding surface of great mechanical advantage." The patterns of these ridges are characteristic of species; and by the changes of pattern which occur as they wear down, the age of the animal may often be closely estimated, a fact constantly utilized in the case of horses. This infolding of the enamel reached its highest complication in the curious "labyrinthodont" teeth of the ancient stegocephalian reptiles.

The dentition of any animal is expressed by a *dental formula*. That of man runs thus:

$$\text{I.}\ \frac{2-2}{2-2} : \text{C}\ \frac{1-1}{1-1} : \text{P.M}\ \frac{2-2}{2-2} : \text{M}\ \frac{3-3}{3-3} = 32.$$

This means that the incisors (I.) number two on each side of each jaw — the numbers *above* the horizontal line corresponding to the teeth in the upper jaw, those below the line indicating those of the lower jaw; while the further subdivision of the teeth above and below the line is meant to indicate the numbers in each side of each jaw respectively. The other signs and numbers therefore read that the canines (C.), premolars (P.M.) and molars (M.) number two, four, and six in each jaw; making a total of 32 teeth. Similarly the dental formula of a ruminant (q.v.) such as the sheep would run thus:

$$\text{I.}\ \frac{0-0}{3-3} : \text{C}\ \frac{0-0}{1-1} : \text{P.M}\ \frac{3-3}{3-3} : \text{M}\ \frac{3-3}{3-3} = 32.$$

It is presumed by this notation that each tooth has its strict homologue, in all kinds of mammals at least; and if any are missing their character or name may be accurately defined. This theory encounters difficulties, for example, in comparing the dentition of marsupials with the higher mammals; but it serves conveniently in the description of ordinary animals.

Among the lower vertebrates teeth appear in great variety, as to number, form and functional modifications. Those of fishes and fish-eating animals as the dolphins, are simple sharp-curved cones, useful in seizing and holding their slippery prey, which is usually swallowed whole. In fishes and most reptiles the teeth are usually attached by ligaments, and shed and renewed, not once only, as in mammals, but frequently during the whole course of their lives. In sharks the teeth are placed in a common groove, and row after row may be developed in fishes as the front and older teeth are worn away or destroyed. Fishes and amphibians may have teeth in two rows in each jaw, and also on the back part of the mouth and on the skull or even on the tongue, gill-arches (*Perch*), pharyngeal bones, sides of the mouth, and in other situations. The lower vertebrates have the teeth fastened in various ways to the jaws, and not implanted in sockets as in man. In reptiles, as a general rule, the base of the tooth is anchylosed to the bone which supports it. The completion of a tooth is soon followed by preparation for its removal and succession, the faculty of developing new tooth germs being apparently unlimited in this class. The teeth of crocodiles grow successively, a new one arising inside the pulp-cavity of the old one and displacing it. In many lizards teeth become anchylosed to the summit of the jaw (acrodont dentition), or to the outer side of the bone (pleurodont). Reptilian teeth sometimes undergo great modifications, as in the hinged poison-fangs of vipers and rattlesnakes (qq.v.). Extraordinary modifications among mammals are seen in the horny pseudo-teeth of the duckbill, the entire absence of teeth of some edentates; the transitory teeth of the baleen whales, succeeded by whalebone; the "horn" of the narwhal, the tusks of the elephant, walrus, wild boar, etc., each in relation to peculiar habits.

There is also a close connection between the articulation or joint of the lower jaw and the nature of the food used by the animal. Thus, in purely carnivorous animals, in which the teeth simply tear and cut the food, no grinding motion is required, and the jaw is capable only of a simple hinge-motion in the vertical plane; while in herbivorous animals the joint is so constructed as to allow of extensive sliding and lateral motion of the lower molar teeth upon the upper. In man both the form of this articulation and the general character of the teeth point to an intermediate position in relation to food, and form a physiological argument for the mixed diet which general custom has decided to be most natural to our species.

Diseases of the Teeth.— Decay (caries) is by far the most common of the diseases which affect the teeth, and consists in a gradual and progressive disintegration of the tooth substance. Among the chief predisposing causes are hereditary defects of quality; imperfect calcification; pits and grooves in the enamel; overcrowding of the teeth, facilitating the retention of particles of food between them; constitutional disorders affecting the digestive organs; and debilitating causes generally. Dental caries consists in the decalcification of the teeth by lactic acid generated in the mouth by fermentation due to micro-organisms. Decay is rarely met with on smooth surfaces exposed to the friction of food and the direct washings of the saliva. It usually begins in some pit or groove in the enamel or between the teeth, such points forming a lodgment for the development of the organisms. Once the enamel has been penetrated the decay proceeds more rapidly, spreading laterally beneath the as yet healthy enamel and toward the pulp. The more dense the structure of the tooth the more directly does the decay penetrate in the direction of the pulp, though its process is not so rapid and its tendency to spread is less. Caries is most common in early life, by far the greater number of cavities making their appearance between the ages of 6 and 18. The treatment of caries can only be undertaken by the dentist, and varies with the extent and character of the disease.

Periostitis and Alveolar Abscess.— Periostitis is an inflammation of the membrane (periosteum) which covers the roots of the teeth and lines their sockets. By far the most common cause is the presence of a dead nerve, the poison-

ous products of which cause violent inflammation at the end of the root. When acute periostitis has fairly set in, it and its usual accompaniment, alveolar abscess, are perhaps the most painful affections to which the teeth are subject.

Alveolar abscess may be defined as a suppuration around the root or roots of a tooth. Its causes are those of periostitis, which precedes it, the continuous and throbbing nature of the pain indicating the formation of matter (pus) within the surrounding bone. The face, with the glands about the neck, swell, and the glands exhibit tenderness on touch. The pent-up pus forces its way through the bone to reach the surface of the gum at the point of least resistance, which is most often opposite the end of the root or roots (this is popularly known as a "gum boil"). With the escape of pus there is a marked abatement in the intensity of the pain, which generally disappears in a few hours and the swelling in a few days.

Impaction and Difficult Eruption.— It is not uncommon to find certain of the temporary teeth firmly set in the adult jaw, and occupying the place of the permanent ones. In such cases the permanent tooth is usually present in the body of the jaw, but it has been retarded in eruption by being too deeply imbedded in the bone. Impaction may also be due to an abnormal direction of growth. Such teeth may appear late in life after all the others are lost, and the bone overlying them has been absorbed and so exposed them. When these cases do occur they are responsible for the popular but incorrect idea of a third set of teeth. An impacted tooth seldom gives rise to any trouble, unless it be an upper or lower wisdom, particularly the latter. The cutting of these teeth is sometimes accompanied by distressing symptoms, which may be protracted for months or years, unless they are removed by extraction of the tooth. This condition is usually due to imperfect development of the jaw. The tooth usually takes its natural vertical direction, but, being wedged in between the tooth in front and the ascending portion of the jaw behind, only a small portion of the crown is visible. The overlying gum is apt to be bruised by the occlusion of the opposing tooth in the upper jaw; inflammation is thereupon set up, and being maintained by biting may extend to the surrounding parts. Swallowing becomes painful and the motion of the jaws restricted. When it is evident that there is insufficient accommodation in the jaw for the erupting tooth it should be removed.

Inflammation of the gums, though not a disease of the teeth proper, is one of the most common causes of their premature loss. It may arise from constitutional causes — chronic dyspepsia, rheumatism or gout — or from the administration of such drugs as mercury or iodide of potassium. Most often, however, it results from the presence of tartar about the necks of the teeth, and lack of thorough cleansing. When due to constitutional causes, their appropriate remedies are called for; but when due to the presence of tartar, this deposit should be carefully removed.

Toothache.— Other diseases of the teeth are less commonly suffered, and more obscure. The advice of a dentist should be sought on suspicion that the teeth are in any respect out of order. An aching tooth is a symptom of disease which requires instant attention. When due to caries with or without simple exposure of the pulp, the attack is brought on by taking hot or cold, sweet or acid fluids, and is seldom of long duration. To afford relief in such cases as these, gently wash out the cavity with a solution of carbonate of soda; then, drying it carefully with a piece of cotton-wool, take a very small pellet of wool dipped in eucalyptus oil and place it in the bottom of the cavity; over this place a piece of cotton wool large enough to fill the cavity and saturated with the following solution: 1 dram of mastic in 1½ ounces of eau de Cologne. This should be changed daily. When the pain is caused by the forming of an alveolar abscess the tooth will be found insensitive to change of temperature but very susceptible to pressure. The patient now becomes feverish, and the pain, which is at first of a dull heavy character, becomes more intense, throbbing, and continuous, till pus has been formed and discharged through the gum. Provided the tooth is likely to prove useful and the patient cannot consult a dentist, the gum should be carefully painted with tincture of iodine, or the old-fashioned plan of placing a roasted fig over the root may be resorted to; at the same time it is well to give an aperient such as Epsom salts, followed by a full dose of quinine — 6 to 8 grains for an adult. Great relief follows this treatment, which is, of course, only temporary. If an abscess shows signs of pointing on the gums it may with advantage be lanced. Poultices should never be applied to the face, for heat tends to draw the pus outward. Abscesses in connection with the lower wisdoms often assume a very serious character unless cut short by extraction of the tooth.

Hygienic Care of the Teeth.— Many of the diseases of the teeth and gums might be prevented or greatly retarded by proper attention to the cleansing of these organs. The implements best fitted for this purpose comprise the quill toothpick, waxed silk thread and brushes, with suitable powders. The toothpick ought to be used after every meal, but it should be supplemented by the use, between the teeth, of floss silk, which will remove deposits accumulating where contiguous teeth touch. The brush is used to remove all deposits solid and mucous, and it gives the teeth a bright and polished appearance; its mechanical friction, too, stimulates the gums to more healthful action. An excellent tooth powder is composed of precipitated chalk, 2 ounces; light magnesia, 2 ounces; oil of cinnamon, 8 drops; thymol crystals, 4 grains; otto of roses, 10 drops. The teeth should be brushed twice daily, in the morning and in the evening. The manner of using the brush is more important than many people suppose. The general method is to brush horizontally, but a moment's reflection will show that this leaves untouched the very situations most in need of cleansing. The brush, used properly, should be pressed against the teeth and the handle rotated so as to make the bristles sweep vertically between and over them; this, coupled with a up-and-down motion, will thoroughly cleanse the interspaces; the inner surfaces of the back teeth are best cleaned in a like manner, while the corresponding parts of the upper and lower incisors are effectually reached by a vertical drawing

movement. The brush should be of medium texture, and the bristles of unequal length, and not too closely placed. A hard-and-fast rule cannot, of course, be laid down for every one to follow, but in the majority of cases it is advisable to use the powder in the morning and a mouth wash with the brush in the evening. For the latter purpose the following is good (especially where a tendency to inflammation exists) — tannic acid, 4 grains; rose water, 1 ounce; tincture of pyrethrum, ½ dram; oil of cinnamon, 10 drops. Over-brushing must be guarded against as carefully as under-brushing, lest the gums and the necks of the teeth be injured. During an illness these precautions are doubly necessary as the corrosive effects of many medicines are then added to the evil results of a weakened vitality. The use of a glass tube in taking medicines that contain mineral acids and iron is usually supposed to be a sufficient precaution against the action of such drugs on the teeth, but this is quite erroneous; the only sure preventive being a weak solution of ordinary baking soda, with which the mouth should be rinsed after every dose. The choice of a tooth-powder should be left to the dentist, for many dentifrices which, no doubt, whiten the teeth, do so by the action of some agent which is as deadly to the tooth substance as to the impurities it is meant to remove. Charcoal (so much used) is quite unsuitable because of its gritty nature. As far as the ordinary individual is concerned, the use of brush and toothpick is the limit up to which one can take care of one's own teeth, so that a thorough examination of the mouth once or twice a year by a trustworthy professional man is necessary to check the diseases of the teeth before they have gone so far as to be irreparable. Especially should this be attended to in children. It is almost impossible to overrate the importance of following, at least in the main if not in detail, the hints given above, for when we consider that the teeth are placed at the very gateway of life, it is not surprising that their neglect should be answerable for many of the disorders of the system. Surely precaution is better than cure. See also DENTISTRY.

Tegnér, tĕng-nār', **Esaias,** Swedish poet: b. Kirkerud, Wermland, 1782; d. Wexiö, Småland, 1846. He was graduated at the University of Lund in 1803, became (1812) professor of Greek literature and member of the Swedish Academy, was ordained priest, and in 1824 was appointed bishop of Wexiö. As a poet he struck out a new path in Swedish literature. His first attempts did not meet with much acceptance, but at length he came to be regarded as the greatest poet of Sweden. His poetry is characterized by inexhaustible wit, rich fancy, and lively feeling. Among his works are 'Frithiof's Saga,' a species of epic, repeatedly translated into English; the national song 'The Gotha Lion'; and 'The Children of the Lord's Supper,' translated by Longfellow. His works were collected and published by Böttiger, his biographer (1847–50; jubilee ed. 1882–5).

Tegucigalpa, tā-goo-sē-gäl'pä, Honduras, the capital of the republic, and of the department of the same name, situated on the Choluteca River, 60 miles northeast of the Gulf of Fonseca. Its cathedral is the finest building in the country, and there are besides five other churches, a university, and other less pretentious public buildings. Gold and silver mines are worked in the neighborhood, which is also a fertile agricultural district. Pop. (1898) about 15,000.

Teguexin, tĕ-gĕk'sĭn, a lizard. See TEJU.

Teherán, tĕh-ĕ-rän', Persia, (1) Capital of a province of the same name, at the northeast and about 66 miles south of the Caspian Sea. It lies in a low plain, with the lofty ranges of Elburz and Demavend rising at the north and east, 20,000 feet being the elevation reached by the latter volcanic peak. The old fortifications were demolished and others were completed in 1874. A fine promenade was made on the site of the old walls and the new fortifications are much more extensive, enclosing an area of about 10 miles. The principal streets extend from the 12 gates to the central bazaar, which displays a great variety of domestic and foreign goods. The ark is the principal feature, and is the name given to the citadel and its enclosures, chief of which is the handsome palace of the Shah, with its extensive grounds and fountains. There are various schools, including a Koran school and a college conducted by European professors. Besides numerous mosques, the buildings of the British legation and of other legations are worthy of notice, and the suburbs lying at the foot of the Elburz hills, contain many charming villas resorted to by the wealthier class in warm weather. The ruins of Rei, in the vicinity, are among the most remarkable of Persia. Water supplied to the town by 30 subterranean canals, is brought from the northern slopes, and in 1866 a tramway was constructed to Shah Abdul Azim, a place of pilgrimage south of Teherán, and others were built connecting various sections of the town. Gas was first used in 1892, to light the city. Harûn-el-Raschid was born in the vicinity. The manufactures include carpets, silks, cotton goods, and iron-ware. Pop. (est.) 250,000. (2) The province of Teherán comprises six districts, containing much fine agricultural land and numerous villages, two of which are held in fief by the British and Russian governments respectively. There are fine coal fields in Kasran, and streams abounding in fish. Veramin District is watered by the Jájrúd River. The chief products are fruit and grain, wheat, barley and rice. A railway, in course of construction under German management, passing through Mesopotamia will connect the Mediterrancan with the Black Sea and the Gulf of Persia. It furnishes an all-rail route from Calcutta to the British Channel, and shortens the distance from Teherán to Constantinople by two weeks. The Anatolian Railway, from Constantinople and Smyrna into the interior will be incorporated in the new railway system, as well as the road projected from Haifa in Palestine on the Mediterranean, to Damascus.

Tehuantepec, tā-wän-tā-pĕk', **City of,** situated in the state of Oaxaca, Mexico, 18 miles from the Pacific Ocean, is the centre of a fertile and productive country, in which coffee, sugar and other tropical products are largely grown. It has a considerable trade in cattle which are raised on adjacent lands. The city is an important station of the new inter-oceanic railway. Pop. about 18,000, including a large number of persons of Indian extraction.

Tehuantepec, Isthmus of, comprises that section of the Republic of Mexico, within the states of Vera Cruz and Oaxaca, where the Gulf of Mexico and the Pacific Ocean approach nearest one another, the distance from the mouth of the Coatzacoalcos River, on the east, to the port of Salina Cruz, on the west, being 143½ miles. This point is one of the rare instances where a depression exists in that vast chain of mountains which extends from north to south along the western shores of both American continents. At Tarifa, the lowest point of the summit level, the altitude is but 754 feet above the sea. Cortes, searching for a safe harbor for his ships, discovered the Coatzacoalcos River, wide and deep where it empties into the Gulf, and pronounced it the finest in Mexico. Informed of the narrow strip separating the two oceans, the conqueror was evidently impressed and at once grasped the idea of inter-oceanic communication at this point. With prophetic insight and influenced by the enormous advantages which were certain to result to the isthmus by the construction of a ship canal, Cortes located a vast land grant, presented by his sovereign, in close proximity, and chose for a title, "Marquis of Tehuantepec." His successors caused superficial surveys of the route to be made and were convinced that no serious obstacles prevented building a ship canal and, considering the diminutive proportions of vessels at that period, the enterprise was well within the engineering capacity of the 16th century. It was proposed to employ slave, native, labor in its construction. Political and strategic considerations prevented the Spanish government from ever encouraging the enterprise. When Mexico became independent it was too much engaged in restoring order to give attention to internal improvements, and it was not until 1842 that a concession for opening a line of communication by canal or railway, or both, was granted to Don Jose de Garay, a citizen of that country. Accurate surveys were made, and a practicable route selected, but, for lack of financial encouragement, the concession was afterward surrendered. Until 1852 capitalists of the United States betrayed no special interest in the enterprise, but when the permanent development of California and Oregon was assured, the importance of more rapid communication between the East and West was quickly realized. In that year the Barnard and Williams expedition was despatched to the isthmus to survey a route for an inter-oceanic railway. These explorers made very careful surveys of the entire route and pronounced the enterprise perfectly feasible, but were subsequently ordered out of the country, the introduction of American capital not being encouraged by the Mexican government, so soon after the war between the two countries. In 1871 the expedition under Commodore Shufeldt was despatched to the isthmus by the United States government to make a final survey and finally determine whether a ship canal could be built over the route or not. The result of the survey was a decision that a ship canal, capacious enough for modern vessels, was not practicable owing to insufficient water supply for the upper levels. This expedition also reported adversely to the lagoons, which indent the western coast and were considered the natural location for a terminal harbor, on account of certain unfavorable physical conditions there existing. A new location for a terminal was chosen at Salina Cruz, a few miles westward of the mouth of Tehuantepec River, where greater depth of water was afforded, as well as more complete shelter from the prevailing winds.

Henceforward all projects for building a ship canal over the Isthmus of Tehuantepec were abandoned, but the Mexican government readily granted concession after concession to parties, mostly Americans, to construct railways; but owing to powerful influences every attempt was frustrated, and the liberal grants suffered to lapse or were withdrawn.

The Eads Ship Railway.— In 1883 James B. Eads, a distinguished engineer, conceived a plan for the construction of a railway over the isthmus by which vessels of the largest dimensions could be transported by rail at a speed of 10 miles an hour. The details contemplated the deepening of the Coatzacoalcos River for a distance of 20 miles to the town of Minatitlan, which was to be the eastern terminus. The western terminus was to be at Salina Cruz. At these points giant pontoon docks were to be located, and three lines of railway of standard gauge connected the two points. As a vessel sailed into the pontoons it rested upon a railway carriage, secured from all strain by ingeniously contrived supports. Raised to the level of the tracks the carriage was connected to three powerful locomotives, and with its load carried across the isthmus and deposited into the sea at the other terminal. The length of the railway was to be 165 miles with a very substantial roadbed and with not greater than 20 mile curves. Where abrupt curves existed, they were to be avoided by turntables at five different points. Vessels in transit were thus always in a straight line. The plan after being subjected to much criticism was at last endorsed by the highest engineering authority in the world, and would probably have been built but for the death of its projector in 1887. Its cost was estimated at $75,000,000. Mexico granted 1,000,000 acres of public land in its aid. Thus for three and a half centuries every plan conceived for the attainment of communication over the isthmus having failed, Mexico determined upon the construction of the railway as a great national work and after an expenditure of $19,181,173, the rails were laid and travel attempted in 1893. The length is 192.42 miles and it extends from the mouth of the Coatzacoalcos River to the Pacific port of Salina Cruz. As a great inter-oceanic route, provided with all the facilities for first-class travel and carriage the railway was still far from complete. At both terminals, only vessels of the lightest draft could gain access. Harbor improvements of great magnitude were required. Subsequently a contract was let to an English firm which provided for its almost complete reconstruction by which the roadbed is to be made more substantial, the curves lessened and the equipment improved. The harbor at the Coatzacoalcos River is being deepened and the bar, which formerly had but 14 feet of water, will eventually allow vessels drawing 30 feet to enter it. A substantial jetty will maintain its depth. At Salina Cruz the harbor improvements are on even greater scale than at the eastern terminus, but when completed vessels of any size can land direct at docks, and allow freight and

passengers to be loaded in cars in waiting at the side. It is believed the Tehuantepec railway will be opened to the world's travel in 1906. By this route the saving in distance, over that via Cape Horn, between New York and San Francisco is 10,797 miles. From Liverpool to Hong Kong 5,353 miles are saved. From New Orleans to San Francisco 8,250 miles.

ENOS BROWN,
Staff Correspondent 'Scientific American,' San Francisco.

Teixeira de Mattos, tā-shā'rä dā mät'tōs, **Alexander Louis,** English journalist and translator: b. Amsterdam, Holland, 9 April 1865. He settled in England in 1874, was educated at Beaumont College, Old Windsor and entered journalism. He has been engaged as correspondent and as associate editor on various periodicals, and has published translations of Melati van Java's 'Resident's Daughter'; Zola's 'Curée'; 'Memoirs of Chateaubriand'; and of the plays: Zola's 'Thérèse'; Josine Holland's 'Leida'; 'The Cradle' (from the Flemish); etc.

Teju, or **Teguexin,** a large lizard (*Tupinambis teguexin*), inhabiting tropical America. The upper parts are deep-black, mottled with green and yellow; the sides show two rows of white spots; and the under parts are yellow, marked with black stripes. A full-grown specimen may be three feet in length, mostly tail. These lizards frequent forests and plantations, are carnivorous, and their strength and speed enable them to catch a great variety of animals, including barnyard chickens and eggs. They are consequently hunted, not only as pests, but because they are themselves good to eat. They dwell in burrows, lay hard-shelled eggs in the ground, and defend themselves by vigorous lashing of the tail. Their general resemblance to the Egyptian *Varanus* gives them the borrowed name "salvator" in some places. This lizard represents an American family, the *Tejidæ*, with long forked tongues largely covered with scale-like papillæ. The teeth are solid and implanted almost on the edge of the jaw, and are therefore intermediate between acrodont and pleurodont. The body is covered with small scales (osteoderms are absent) or the skin may be simply granular above; the under surface is covered with larger scales, generally arranged in transverse rows. "This large family," says Gadow, "which comprises nearly 40 genera with more than 100 species, exhibits great diversity of form. Some are inhabitants of forests and are arboreal, while others are strictly terrestrial, preferring hot and sandy plains, or they dwell below the surface and are transformed into almost limbless and blindworm-shaped creatures." Representatives of the family are spread from Texas and Utah to the borders of Patagonia.

Tekeli, těk'ĕ-lĭ, or **Tököly,** tĕ'kėl-yĭ, **Emmerich,** COUNT OF, Hungarian noble: b. about the middle of the 17th century; d. Nicomedia, Asia Minor, 1705. His father had headed an insurrectionary movement against Austria, and he himself was chosen by the Hungarians in 1678 their commander-in-chief. He broke into Upper Hungary, captured several fortresses and towns, devastated Moravia, and penetrated into Upper Austria. The emperor consented to redress several grievances at the Diet of Oedenburg (1681); but the insurgents were not satisfied, and refused to lay down their arms. Tekeli now put himself under the protection of the Sultan Mohammed IV., by whom he was declared king of Hungary. A war between the emperor and the Porte ensued in which the Turks advanced (1683) as far as Vienna, but were totally defeated before that city by John Sobieski, king of Poland (12 Sept. 1683). The count continued the war, but without success. He fell under the suspicion of the Turks, who sent him a prisoner to Adrianople (1685). Meanwhile his wife was besieged by the Austrians in the castle of Munkács, where she held out for three years, until she was compelled by famine to surrender (January 1688). The Turks discovered the groundlessness of their suspicions of Tekeli, and he once more received the support of the sultan, who designated him prince of Transylvania. He penetrated into that country, and routed the imperial general (1690); but in the same year he was compelled by Louis, margrave of Baden, to retire. He continued in all the struggles between Austria and Turkey till 1697, when the Peace of Carlovitz was concluded, in which Turkey renounced the cause of the Hungarians. Tekeli then retired to the dominions of the sultan, who conferred upon him several estates, with the title of prince of Widdin.

Tel-el-Amarna, tĕl-ĕl-ä-mär'nä, Egypt, a group of ruins on the east bank of the Nile about 150 miles south of Cairo. It contains remnants of tombs and of a palace of Amenophis IV. A number of cuneiform tablets have also been found, containing diplomatic correspondence between Amenophis and the kings of Babylonia and Assyria.

Tel-el-Kebir, tĕl-ĕl-kĕ-bēr', Egypt, a village situated about 45 miles northeast of Cairo. Here the Egyptian army under Arabi Pasha suffered a severe defeat at the hands of the British under Wolseley, 13 Sept. 1882.

Telau'tograph, an instrument for the instantaneous transmission of a facsimile copy of writing or pen drawing. Telautograph was the name given by Elisha Gray, who invented the apparatus to his particular form, but it has been extended to cover varieties of machines having the same purpose. In Gray's apparatus the transmitting pen is connected by cords to mechanism by means of which the motions of the pen cause a pulsatory current to pass into two telegraph wires. These pulsatory currents produce rapid pulsatory motion of the armature of a system of electro-magnets by means of which the receiving pen is caused to follow the motions of the transmitter. Another electro-magnetic arrangement lifts the receiving pen off of the paper at the end of each line, while still another moves the paper forward to receive the next line from the pen. This apparatus can be used on the same wires as a telephone without disturbing the use of the latter, does not require an operator at the receiving end, and interception of the message by wire tapping is impossible.

In a modified form of telautograph known as the telechirograph, invented by Gruhn, a radically different receiving apparatus is used. The transmitted currents influence two electro-magnets which in turn cause a small concave mirror to move; a light ray from a small incandescent

lamp falls upon the mirror whence it is reflected to a sheet of sensitized paper. The mirror is attached by means of cement to a small iron plate in the form of a triangle, one corner of which rests upon a set screw upon which the mirror can oscillate. Beneath the two other corners extend two armatures subjected to the attraction of the electro-magnets. These armatures undergo oscillations corresponding to the component movements of the transmitting pencil; they are carried by flat springs, and the oscillations are given to the iron plate and, of course, to the mirror fastened to it. Before the message can be delivered the receiving sheet must be developed; the apparatus for this is simple: when the message is completed a small electric motor operated by an independent battery in the receiving room is set in motion; this motor works a train of wheels or rollers which draw the portion of the film written upon by the light ray through a developing bath and out again through a pair of rubber drying rolls. The completed message is delivered in less than 35 seconds after the transmitting operator has placed his pencil in its rest.

Telechirograph. See TELAUTOGRAPH.

Tel'edu, a badger (*Mydaus meliceps*) of Java, which is skunk-like in its habits, and in the copious and far-reaching vileness of the secretion in its anal glands.

Teleg'ony, the inheritance by offspring of the characteristics of some previous mate of one or both parents. That such inheritances existed has long been the belief of breeders of livestock, who spoke of the phenomenon as "throwing back." It was alleged that it might arise from a case where the dam had been previously crossed with a male of different characteristics; or from a cross with a sire which had previously been mated with a different female. Breeders ascribed the results to "infection" of the parent, and have taken extraordinary pains to avoid it by great care in mating where they were anxious to preserve a particular strain. Until about 1890 scientific men generally lent their support to this thesis, although Weismann long ago expressed serious doubts. About 1895 Ewart began a series of careful experiments at Penicuik, near Edinburgh, Scotland, and certain others were undertaken in Germany and Brazil, the outcome of which was to show that the phenomena noticed were evidences of atavism, or reversion or variation, and that no such a thing as telegony existed. See HEREDITY.

Telegraphy. The word telegraph is derived from the Greek, *tele,* "afar off," and *graph,* "to write." In the modern practice of telegraphy, however, the term has a wider meaning and is used to signify any means by which intelligence is transmitted to a distance by signs or sounds. In this sense the word would also include the transmission of speech electrically to a distance, but inasmuch as that highly important art possesses its own appellation (telephony) such a use of the word is unnecessary.

From remotest times methods of communicating intelligence to a distance have been employed for purposes of war and defense. The Greeks were perhaps the first to adopt systematic methods of telegraphing, and a description of a telegraph system that was employed 300 B.C. is to be found in the writings of the Greek General Polybius.

Polybius Telegraph.— The operation of this system was as follows: At each station there were two walls about seven feet in length and about six feet in height, separated by a space of three feet. At night one or more torches, as desired, but not exceeding five in all, were placed on top of the walls, and certain combinations of the torches represented the letters of the Greek alphabet. A tablet showing the combinations of torches for the various letters was provided at each station. For instance, two torches on the right-hand wall and three on the left wall would represent the letter H. Five torches on the right wall and four on the left, Y, and so on. When it was desired to signal a station, two torches were set on a wall, which signal was answered by a similar arrangement of torches at the other station. The operator then proceeded to spell out his message by placing the torches in the required combinations, one letter at a time. When not in use for signaling the torches were placed behind the walls. The tablet mentioned was divided into five vertical and five horizontal rows of squares, each letter of the alphabet being allotted a certain square, beginning at the upper left-hand corner with A, and running horizontally across the tablet. Any letter could thus be found by giving the number of vertical and horizontal rows at the intersection of which was the square allotted to that letter. For instance, the letter Y would be at the intersection of the fourth horizontal and the fifth vertical rows. The code thus formed, in a more or less modified form, is in use to-day by the military departments of various countries as a means of telegraphing maps of a locality. For this purpose the map is drawn on a sheet of properly squared paper of which there are duplicates at each station. The outlines of the map are indicated by sending by telegraph or telephone the numbered vertical and horizontal rows of squares intersected by the lines of the map.

Fire and Smoke Signals.— The use of fires by night and smoke by day has long been practiced by even the most uncivilized races, as a means of communicating intelligence to a distance. In numerous places in this country there still remain evidences of this practice by the aborigines, in the shape of mounds on hill tops and other points of advantage, on which the accumulated ashes of beacon fires of bygone years may be found beneath the roots of trees of gigantic size. In the country between Chillicothe and Columbus, Ohio, for instance, may be traced over 20 such mounds, so related to one another that if all the trees were removed fire signals might be transmitted from one end of the valley to the other in a few minutes. To this day the Indians of North America practice this method of signaling the approach of enemies in their territory; and up to within a comparatively short time beacon fires were the most favored methods of signaling the approach of an enemy in Great Britain and other parts of Europe.

Semaphore Systems.— It may in truth be said that it was not until the end of the 18th century that any comprehensive plan of signaling was employed in Europe or in this country. The plan then introduced was that known as the Chappé semaphore system of signaling. This semaphore resembled the semaphore so common on all railways to-day, consisting of an upright post, on the top of which movable arms or blades are pivoted, but in the Chappé semaphore the arms were arranged quite differently from those of the ordinary railroad device. Thus the cross-arm on the top of the post was 14 feet in length, and at each end of this arm a shorter arm was pivoted at right angles to the longer arm. By a system of ropes and pulleys these arms could be manipulated by the operator and placed in many different positions, certain positions of the arms representing given letters of the alphabet. Hence by appropriately placing the arms, the manipulator could spell out words and messages which an operator at a distant station could read and, if necessary, retransmit to another station further on. These semaphores were placed on substantial stone towers at distances apart ranging from 6 to 10 miles, and their use spread rapidly throughout Europe. In France, Germany and Russia especially the system was widely used. For example, a string of 220 semaphore towers, extending from the Prussian frontier to St. Petersburg, via Warsaw, a distance of over 1,200 miles, and employing over 1,300 operators was erected at great expense. In Prussia also a line of semaphore stations from Berlin to Treves, via Potsdam, Magdeburg, Cologne and Coblentz, was established in 1832, at a cost of 170,000 thalers. In France there was a semaphore line from Paris to Toulon, 475 miles apart, and requiring 120 stations.

The transmission of signals by semaphore systems was necessarily slow (about one signal per minute), inasmuch as each signal was verified by the receiving station before another was transmitted. The time taken in transmitting a signal or letter from Paris to Toulon was, however, comparatively speedy, namely, 10 to 12 minutes.

Many of these lines of semaphore stations had been scarcely well established when they were supplanted by electric telegraph systems.

Semaphore signaling is, however, still usefully employed in some countries for communicating from ship to shore, between coast-guard stations, at rifle ranges, etc. One plan of this kind consists in the use of two small flags, one held in each hand. The flags are about 18 inches square, the staff is abont 3 feet in length. The letters of the alphabet are represented by the positions in which the flags or the arms are held. For instance, R is indicated by holding the two flags at arm's length at right angles to the body; the letter B by holding the right hand flag at arm's length at a right angle to the body, the other flag being out of service, or in front of the body. The letters from A to G are represented by one flag on the right side of the body, the position of the flag or arm varying 45° of a circle for each of said letters, beginning with A, for which letter the flag is held in the right hand, the arm pointing to the ground at an angle of 45° from the body; for B the right arm is held at a right angle to the body, as stated, and so on. With the aid of a telescope, signals may be transmitted by this method to a distance of three miles in fair weather. Messages may also be read by the use of the arms alone, employing the same alphabet, in which case this is termed the human semaphore.

Electric Telegraph Systems.— Although up to 1852 a number of visual systems of telegraphy, such as the semaphore system, were, as stated, in quite extensive use, electricity had been utilized experimentally long prior to that date for purposes of telegraphy, but its growth in this direction was slow and the scepticism with which its commercial utility was at first regarded is evidenced by the extensive establishment of semaphore stations, just mentioned, long after the possibility of electric telegraphy had been more or less clearly indicated.

In 1774, Lesage of Geneva constructed an electric telegraph system which employed in its operation 24 line wires, one for each letter of the alphabet. At the terminal of each wire pith balls were suitably suspended, and, taking advantage of the well-known repellant effect that follows the similar electrification of such light substances, Lesage, by the use of frictional electricity applied to the wires, transmitted intelligible signals over them. In 1815 Francis Ronalds of England improved on this arrangement. A revolving dial, operated by clock-work, was employed at each end of a wire. The dials rotated synchronously. A notch was cut in each dial, behind which the letters of the alphabet were placed in a circle, so that as the dial revolved one letter at a time was seen through the notch. Pith balls were electrically connected at each end of the wire. At a given signal the dials were set in rotation and as the notch arrived at a desired letter the pith balls were actuated electrically. The letter was noted and in that way messages were transmitted. In 1774 Volta had discovered that electricity could be generated by means of the "voltaic" battery, and availing of the current from such a battery efforts were made, with more or less success, between the years 1806 and 1830, to utilize the electrolytic property of an electric current to decompose chemical solutions at the distant end of a wire to indicate telegraph signals. These experiments were the precursors of others more successful in the line of electro-chemical telegraph systems of later years, and to which further reference will be made herein.

Needle Telegraph Systems.— Availing of Oersted's discovery that a pivoted magnetic needle is deflected from its normal position, parallel to a wire, when an electric current passes in that wire needle telegraph systems came into existence and were extensively employed in Europe at one time, and are yet in use there. For this purpose a magnetic needle is pivoted in the centre of a coil of wire, and a pointer suitably at-

tached to the needle, swings in front of a dial. The needle and with it the pointer can be deflected to the right or left by changing the direction of the current through the coil. Certain deflections of the needle to the right or left, or combinations of deflections to the right and left represent the letters of the alphabet, and these deflections are produced by sending over the wire current pulsations in positive or negative direction, or alternations of both, as required by the letter to be transmitted. For instance, if the Morse alphabet were used, a motion to the right would represent a dot; one to the left a dash. The alternations of polarity are transmitted by a "drop-handle" or a "tapper." The tapper is similar to the double-sending key used in submarine telegraphy. See Fig. 17. A needle system employing two needles has also been used. This required two wires, but gives a higher rate of speed — about 15 to 20 words per minute. The operator reads incoming signals by observing the movements of the needle or needles.

Bright's Bell.—A modification of the needle telegraph is that known as "Bright's Bell," in which two bells of different tone are struck by a hammer, one tone representing, for instance, a dot; the other, a dash. In other instances, the needle of the needle system is caused to strike metal tubes of different tones, one tone indicating a deflection in one direction, the other tone a deflection in the opposite direction. These have been termed accoustic telegraphs.

Electric Chemical Telegraphs.— See TELEGRAPHY, AUTOMATIC.

Morse Electro-Magnetic Telegraph.— In 1824 Sturgeon of England discovered that when a current of electricity is caused to flow in an insulated coil of wire, surrounding a bar of soft iron (that is, well-annealed iron), the bar takes on magnetic properties, and when the current ceases to flow in the coil the iron at once loses its magnetism. Employing these electro-magnetic phenomena, Morse, in 1837, invented the telegraph system which bears his name, and which today is in extensive use in one form or another in every part of the world. It was then known that when a piece of soft iron is placed near a magnet there is a mutual magnetic attraction which tends to draw them together. This fact is also availed of in the Morse telegraph system as will be shown in the case of the Morse relay and sounder.

To obtain the flow of current in the coil of wire required to magnetize the iron bar, the circuit must be complete, and a source of electromotive force must be provided.

An electric "circuit" may be represented, as in Fig. 1, by a line or wire, W; battery, B, the thin and thick lines of which in the figure conventionally represent the positive and negative plates or elements of a primary chemical battery. The source of electromotive force in telegraphy for many years in this country was the "bluestone" or "gravity" battery, the elements of which are zinc and copper in a solution of sulphate of copper in a glass jar. These cells are arranged in series; 2 or 3 for local circuits and from 25 to 350 for main line batteries. Of recent years these batteries and the bi-

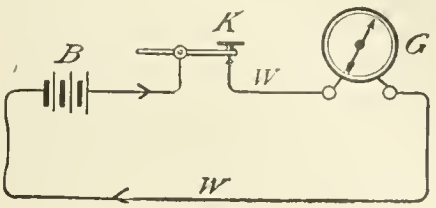


Fig. 1. Metallic Circuit.

chromate primary batteries employed in Europe, have given way largely to storage batteries and dynamo machines as a source of electromotive force.

When dynamos are employed they are in some cases designed to develop about 70 volts each. Several of these machines are connected in series so that by tapping the machines at different points an electromotive force of 70, 140, 210 volts, etc., may be obtained. In other cases dynamos developing 70, 140, 300 volts, respectively, are employed. Two sets of such machines are provided, one set to furnish positive polarity, the other negative polarity, inasmuch as it is essential in the practice of telegraphy to utilize currents of opposite direction or polarity; instances of which will be noted in connection with the descriptions of duplex and quaduplex telegraphy in this article.

Reverting to Fig. 1, G is a galvanometer, an instrument to indicate the presence of an electric current in a circuit, and which is constructed on the principle of the indicating needle of needle telegraph systems previously mentioned. The direction of the current in the circuit is assumed to be from the positive pole of the battery B to the galvonometer G, and back to the negative pole of the battery. The key K affords a ready means of "opening" and "closing," or of "making" and "breaking" the circuit. When the key is closed, or down, the circuit is complete and current flows; when the key is "open" or up, the circuit is open or broken, and no current flows therein. An ordinary telegraph circuit without instruments is indicated in Fig. 2. This is termed a ground

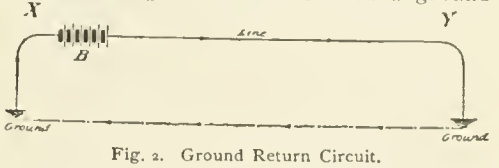


Fig. 2. Ground Return Circuit.

return circuit. A circuit like that indicated in Fig. 1 is termed a "round" or metallic circuit. In the case of a ground return circuit the earth acts virtually as though it were a wire of inappreciable electrical resistance, completing the circuit from end to end.

In the Morse telegraph system signals are transmitted electrically from one station to another by the opening and closing of the circuit, or wire, by means of the key, for short and long intervals, which acts operate the Morse relay and sounder or register, and

cause them to produce sounds or printed characters corresponding to dots and dashes of what is known as the Morse telegraph alphabet.

In Fig. 3 is shown theoretically the essential apparatus of a Morse telegraph equipment at two terminal stations, X, Y. B is the battery; K is the Morse key. S is an iron core or bar, arranged in the shape of a horseshoe, around which a coil of fine wire is

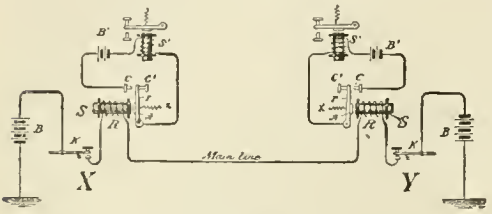


Fig. 3. Morse Telegraph Circuit.

wound. A is a small piece of iron, termed the "armature," which is mounted on a pivoted lever *r*. A retractile spring *x* withdraws the armature from the ends of the core S when the latter is demagnetized. The play of the lever is limited by the stops *c c'*; the front one of which, C, is a contact point that acts as a key for a local circuit in which are included small battery B' and the coils of the sounder S'. The relay R consists essentially of the iron core S, the coil of wire and the lever *r*. It also has devices for adjusting the position of the armature relative to the ends of the core, and screw posts for facilitating the connections of the wires leading into and out of the instrument. (See Fig. 5.)

The object in using the sounder S' in Morse telegraphy is to obtain louder sound than is practicable with the Morse relay. The magnetism developed in a given electromagnet, such as a relay or sounder, increases with the strength of current, also with the number of convolutions of wire in the coils, within certain limits. In fact, up to the point of magnetic saturation of the iron, the resulting magnetism is directly proportional to the product of the current strength in amperes by the number of convolutions, or turns, of wire; which product is termed the "ampere turns." Saturation is however seldom or never reached in the magnets used in telegraphy. Again, with a given electromotive force the current strength is inversely proportional to the resistance of the circuit, and as the resistance of a wire of given diameter increases directly with its length, the longer the wire, the weaker will be the current. It is found that to produce the clear, loud click of the ordinary Morse sounder, about .25 ampere is required, while a main line relay will operate freely with .040 ampere (40 milliamperes). To operate a sounder placed in a main line having 1,200 ohms resistance would require an electromotive force of about 300 volts. It is therefore more economical and in other ways better to employ a lower electromotive force, about 60 volts in this case, and a relay having many turns of finer wire than the sounder (about No. 30 B & S gauge) and a light armature, not designed to produce a large volume of sound, which relay by means of its armature lever and a "local" battery is then caused to operate a sounder as indicated in Fig. 1.

The sounder is constructed on the same principles as the relay, but the wire with which it is wound is larger, about No. 24 B & S gauge, and its armature and lever are heavier. Since the lever *r* of the relay controls the local circuit of the sounder it follows that as the main line is closed and opened, thereby closing and opening the relay, the local circuit will be similarly closed and opened, by which actions the electromagnet of the sounder will be correspondingly alternately magnetized and demagnetized, and the armature lever will be attracted by the magnetism and withdrawn by its retractile spring. The motions of the sounder thus produced cause the long and short sounds which are translated into letters of the alphabet by an expert operator. When a Morse register or ink recorder is used in place of the sounder these dots and dashes are embossed or printed on strips of paper from which the message may then be transcribed by any one familiar with the dot and dash code. Plainly many more relays may be placed in the main circuit than are shown in Fig. 3. It is not uncommon in this country to have 30 or 40 relays in one Morse telegraph line, and with but two main batteries, one at each end. When any one of the keys of a Morse telegraph circuit is open none of the remaining keys can close the circuit, and when any one key is operated all the relays on the same wire will be operated concurrently, by reason of the opening and closing of the circuit by that key. Any attempt to operate two keys at once on this circuit results in the clashing of signals. Such circuits are termed "single" or "simplex," inasmuch as but one message at a time can be sent over them. This fact distinguishes simplex from multiplex circuits over which two or more messages can be transmitted simultaneously, instances of which will be given herein.

The arrangement of Morse circuits just described is termed the "closed circuit" method of operation, from the fact that the circuit is normally closed with current on the line. In Europe the Morse circuits have generally been operated on what is termed the "open circuit" plan, which consists in so arranging the apparatus that the battery shall only be placed to the line when a message is to be transmitted; at other times the battery is disconnected from the line. For this purpose a key with front and back contacts is used, similar to K in Fig. 14; battery being placed as there shown, and the receiving instrument being placed in the circuit of the back contact at *x* in that figure. In the open circuit method battery is necessary at every station.

Telegraph Alphabets.— The American Morse code or alphabet which is in general use on overland Morse telegraph lines in the United

States and Canada is composed of dots and dashes, and of combinations of dots, dashes and spaces. Letters made up partly of spaces are termed "spaced" letters. The letters C and R are instances of spaced letters. (See Morse alphabet.) Dots, dashes and spaces are formed by the length of time during which the key or other transmitting instrument may be held closed or open; the time of making a dot being taken as one, or

LETTERS.	MORSE.	CONTINENTAL.
A	·—	·—
Ä		·—·—
Å or Å		·——·—
B	—···	—···
C	—·—·	—·—·
Ch		————
D	—··	—··
E	·	·
F	··—·	··—·
G	——·	——·
H	····	····
I	··	··
J	·———	·———
K	—·—	—·—
L	·—··	·—··
M	——	——
N	—·	—·
Ñ		——·——
O	———	———
Ö		———·
P	·——·	·——·
Q	——·—	——·—
R	·—·	·—·
S	···	···
T	—	—
U	··—	··—
Ü		··——
V	···—	···—
W	·——	·——
X	—··—	—··—
Y	—·——	—·——
Z	——··	——··
&	·—···	

NUMERALS.

	MORSE.	CONTINENTAL.
1	·————	·————
2	··———	··———
3	···——	···——
4	····—	····—
5	·····	·····
6	—····	—····
7	——···	——···
8	———··	———··
9	————·	————·
0	—————	—————

.	Period	·—·—·—	·· ·· ··
:	Colon	———···	———···
;	Semi-colon	—·—·—·	—·—·—·
,	Comma	——··——	——··——
?	Interrogation	··——··	··——··
!	Exclamation	·—·—·—	·—·—·—

one "time unit." In length or duration a dash is theoretically equal to three time units. The space between the elements of a non-spaced letter is equal to one time unit; the space between letters of a word is equal to three time units; the space between words, to five time units; the interval in spaced letters is equal to three time units. The object of the framers of this alphabet in utilizing spaces in some of the letters was to minimize the length of the letters and thus practically to increase the speed of transmission by this alphabet. It was found, however, in automatic telegraphy (q.v.) that the use of spaced letters increased the liability to errors, and hence an alphabet, known as the Continental or Universal Code, was adopted in Europe in which spaced letters are not used. This alphabet is now employed universally in Morse telegraphy outside of the United States and Canada. The American Morse and Continental Morse alphabets or codes are given below.

Morse Telegraph Apparatus. Manual Transmitting Keys.— As previously intimated, the characters of the Morse alphabet are formed by the manipulation of a suitable key. The key originally employed by Morse was a cumbersome piece of apparatus. The key now employed in the United States could not well be made lighter. Its construction will readily be grasped by reference to Fig. 4. A

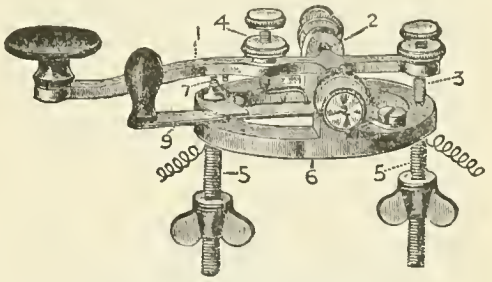


Fig. 4. Morse Telegraph Key.

steel lever 1, is pivoted at 2. Metal legs 5, 5 project through the desk or table, and are held securely thereto by the clamps shown. The right leg is connected directly to the metal base 6; the left leg passes through the base and is insulated therefrom by a hard-rubber bushing. On its top there is a cone-shaped cap, termed the anvil, carrying a small platinum contact point, 7. A small strip of metal extends out from the cap. At a point on its under side, directly above the contact 7, the lever 1 is provided with a platinum contact 8, termed the hammer. A curved strip of metal 9, the "circuit closer," is pivoted on the base 6. When the circuit closer is pushed under the strip projecting from the cap 7, it closes the circuit, regardless of the opening between the anvil and the hammer. The lever 1 and the circuit closer 9 are supplied with hard-rubber finger tips, or knobs, by which they may be handled freely without danger of shocks. A spring adjustable by a set screw 4, normally lifts the lever 1 from the anvil. When the operator is about to "send," the circuit closer must be first pushed out from 7 so that the lever

when operated may open and close the circuit; for it will be seen that when the hammer is brought into contact with the anvil the circuit is closed at that point. Platinum is employed at all important contacts because of its durability and freedom from oxidation due to the sparking which usually occurs when electric circuits are broken. The manually operated Morse keys employed in Great Britain and Europe are practically similar to that shown here, but they are larger and heavier.

Morse Telegraph Relay.— The electromagnet which Morse first employed in telegraphy weighed over 300 pounds. In 1844, however, the weight of this instrument had been reduced to 185 pounds. Within 15 years from that time many improvements had been made in the instrument, and it then weighed but little more than the modern main-line relay, (typified in Fig. 5) about three pounds. As late as 1867 relays were wound to 1,100 ohms; the present standard resistance of this instrument is about 150 ohms. In the case of what are termed "low resistance" relays the coils are wound to 37.5 ohms. These relays are utilized in a number of instances where many relays are employed on one circuit, as on railway telegraph lines, and the total reduction of resistance brought about by their use is found to effect a very beneficial result in the operation of the circuits in wet and foggy weather. The obvious explanation of this result is that, since the electric current seeks the path of least resistance, the lower the resistance of the wire circuit the less will be the tendency of the current to escape by the "leaks" to ground, where foliage, trees, etc., touch the wire.

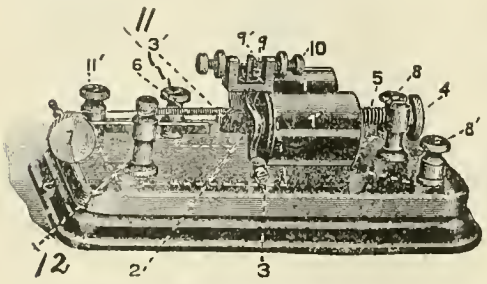


Fig. 5. Morse Telegraph Relay.

In Fig. 5, the two coils surrounding the U-shaped, soft iron cores are shown at 1, 1. These coils are covered by hard rubber sleeves. The armature 2 in this type of relay is a part of the iron lever 9'. These relays are adjusted in two ways; either by drawing the cores away from the armature by means of the screw 4, or by means of the retractile spring 6 attached to the armature, the tension of which is variable by the winding device 7. This winding screw is movable toward or from the relay coils by aid of the post 12 through which the supporting piece of 7 passes. The main line wires are connected to the screw posts 8, 8, from which small wires lead to the coils 1, 1. The local, or sounder, circuit wires are brought to screw posts 11', 11, from which posts wires lead to the armature lever 2, and to the front contact 10. The object of the relay being to repeat or relay the signals passing on the main line to the sounder, the play of the armature lever (which latter is pivoted at 3, 3'), should not be large. This play is regulated by the front stop screw, that is, the stop next the coils, and by the back stop screw, which is insulated.

Pony relay is a name given to an instrument which differs only in minor details from the main line relay. It is used mostly on short lines. For lines 20 to 40 miles in length it is wound to about 45 ohms; for lines up to 75 miles about 75 ohms.

The "box relay" is a type of relay used by repairmen. It is an ordinary Morse relay, the coils of which are covered by an oblong wooden box which acts as a sounding board, making the signals audible without the use of a sounder.

Telegraph Sounder.— Many different styles of sounders are in use. A well-known form is illustrated in Fig. 6. In this B, B are the

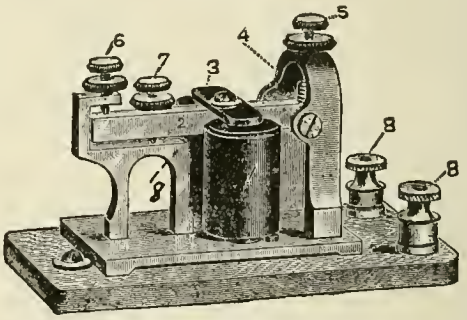


Fig. 6. Morse Telegraph Sounder.

binding posts; 1 represents the electromagnets; 2 the lever, pivoted on the support 4; a spring adjustable by the screw 5 gives the left end of the lever a tendency to rest on the upper stop 6. Magnetism in the cores draws the armature down, and with it, the lever, until the stop 7 meets the metal support 8. The base is designed to give resonant effects. When used on primary battery circuits these sounders are wound to 4 ohms; when employed on dynamo circuits they are often wound to 20 and 40 ohms.

Morse Recording Register and Ink Recorder. — Before the present method of receiving by sound was adopted the Morse embossing "register" was in extensive use as a receiver. It consists of an electromagnet, usually operated by the lever of a relay, placed in an oblong box, containing gearing and a spring motor, by means of which two brass rollers may be rotated. An extension from the armature lever of the electromagnet carries a pencil which when the armature is operated makes long or short indentations, corresponding to dashes and dots, on a strip of paper which is drawn along by the rollers when the machine is in operation. This instrument is now mainly used in connection with district telegraph messenger service, etc., in this country.

An ink recording register is shown in Fig. 7. A disc D and ink-roller I are supported on

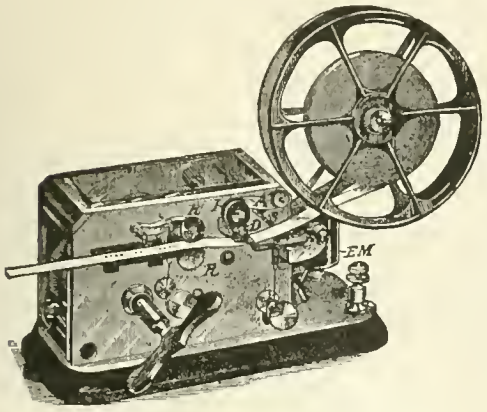


Fig. 7. Morse Ink Register or Recorder.

the outside of the box. The ink-roller is held lightly against the disc by a small spring S that pulls on the arm A which supports the roller. This keeps the edge of the disc wet with ink. The paper strip is drawn along by the rollers R R′, which are operated by clock-work within the box. The armature lever of the electromagnet EM reaches to a point under disc D, and, as the armature is operated, the paper is lifted up against the disc at intervals, by which action a long or short mark is impressed on the paper according to the duration of the impact of the paper against the disc. This recorder, or modifications thereof, is used in wireless telegraphy and in Morse telegraphy in several countries. It is also used for recording calls in Fire Alarm, Police Signal systems, etc. Devices by which these instruments start and stop automatically are provided. Such devices usually consist of an arm which is brought into the path of a pin on the face of a revolving wheel of the clock-work, after the armature lever has been idle for a certain brief time. When the armature lever is again operated it lifts the arm out of the path of the pin, whereupon the clock-work at once starts.

Telegraph Transmitters.— With the object of obtaining a simple and speedier method of transmitting the characters of his alphabet than the manually operated key method, Morse devised several mechanical arrangements. One of these consisted of a plate of ebonite or wood on the surface of which were placed in a vertical row short and long strips of metal, corresponding to the letters of his alphabet. These strips were all metallically connected under the plate by a wire which led to the battery, relay and ground. The line wire was connected by an insulated wire to a metal stylus. This stylus was held in the hand of the operator and in transmitting a message he would run the point of the stylus over the metal strips representing the given letters, thereby closing and opening the circuit, in a manner corresponding to the manual transmission of the letter. Another somewhat similar device, also due to Morse, consisted of a metal cylinder on the surface of which the characters of the Morse alphabet were arranged in a practically similar way. A keyboard was arranged over this cylinder and the depression of a key brought a metal brush into contact with the cylinder. At the same time the cylinder was caused to make a partial revolution. The characters on the cylinder being connected to the line, and the brush to the earth, the foregoing described actions resulted in the transmission of Morse characters. These transmitters did not go into wide use at that time, but within the past four or five years a keyboard transmitter, termed the "Yetman" transmitter, which is a much improved form of the Morse cylinder transmitter, has been largely adopted by telegraph operators in this country. The employment of this device was no doubt encouraged by the recent employment by operators of the typewriter as a means of transcribing received messages, which gave the receiving operator an advantage over the sending operator who could only send from 30 to 40 words per minute at best speed. By means of the keyboard transmitter a speed of transmission approaching the speed of transcription by the typewriter is obtained. This use of the typewriter was accompanied by a new arrangement of the sounder, which is now placed in a box, or resonator, mounted on an adjustable rod that brings the sounder in close proximity to the ear of the operator.

Lightning Arresters.—Lightning discharges tend to follow telegraph wires into cables across rivers, and into the telegraph offices, causing damage to the cables and instruments. Damage is sometimes caused also by the contact of telegraph wires with electric light and power wires. To prevent as far as possible damage from these causes, lightning arresters and fuses are placed at points just outside of cables and at points where the wires enter offices. A combination lightning arrester and fuse wire is shown in Fig. 8.

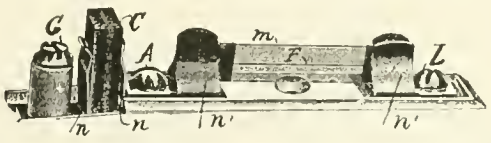


Fig. 8. Lightning Arrester and Fuse Wire.

F is a small fuse wire carried on a strip of mica *m* which is tipped with metal at each end, and held by metal clips *n′ n′*. C represents two small blocks of carbon separated by a thin sheet of mica, and held in position by metal tension springs *n n*. The left-hand block is connected to ground at the post G; the right-hand block is connected to the screw A from which a wire leads to the apparatus. The line wire is connected to the screw L. A strong current passing through the fine wire F will fuse it; a lightning discharge will jump to ground by way of the carbon blocks; in either case protecting the cable or instruments.

Telegraph Switchboards.— Switchboards are

employed in telegraph offices for the purpose of facilitating the testing of wires, and the assignment of different wires to different desks. By means of these boards also, electromotive forces of different potentials and polarities may readily be assigned to any desired wire. For main offices the switchboard, E, Fig. 9, usually consists of a large board, or series of boards, of a desired size, say, six feet long by four feet wide, on the face of which brass strips s, termed straps, about five-eighths inch wide, are arranged vertically, three-quarters of an inch apart. On the back of the board similar straps, *a, b, c, d, e,* are arranged horizontally. Metal discs D connected to these horizontal strips pass through holes in the board and are set flush with the face of the vertical straps. Semi-circular notches are cut in the sides of the discs nearest the straps and in the adjoining straps, into which cone-shaped metal pins with an insulating handle may be inserted as at *x, x*. The straps are connected at their lower ends to devices termed double spring-jacks, as indicated by J, J′. The desk instruments are connected with a double conductor flexible cord DC, which, by means of a wedge W, inserted in the spring-jack, as shown at J′, places the instruments in the circuit of the line wire as at z′. This circuit takes positive current from main battery MB′ by way of post P′, strip b, pin plug F and strap 2. By placing the pin at A, strap 2,

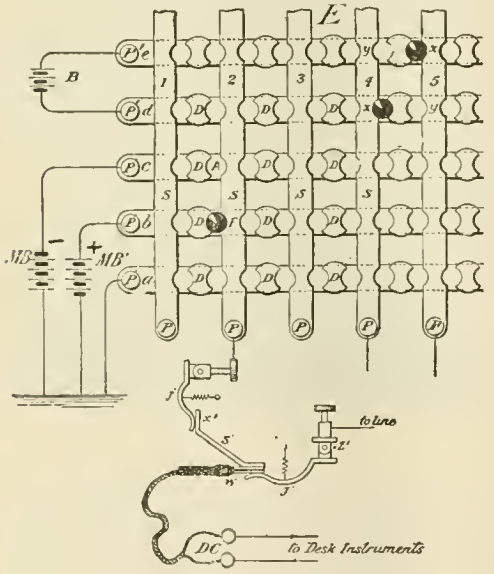


Fig. 9. Telegraph Switch Board.

current of negative polarity from MB could be supplied to line. B is an "intermediate" battery, inserted in this case in the wires connected at *x x* with straps 4, 5. By means of the wedge W the desk instruments connected therewith can be quickly inserted in the circuit of any other wire entering the switchboard.

Way office switchboards are arranged somewhat similarly to the main office switch, but are much smaller.

Automatic Telegraph Repeaters.— The function of a Morse automatic repeater is to take, as it were, the message from one wire and "relay" it to another wire without the intervention of an operator. Some of the reasons that render repeaters necessary are, first, that the resistance of the wire increases directly with its length, which tends to a diminution of current strength; second, the escape of current from the line wire at points where it makes contact with trees is greater on a wire of high resistance than one of low resistance (see RELAYS); third, the speed of signaling decreases as the electrostatic capacity is increased and this capacity increases with the length of the wire. Hence it is found desirable in practice to limit the direct length of a telegraph circuit to a maximum of about 500 miles in this country.

The apparatus and circuits of an automatic telegraph repeater at an intermediate station are outlined theoretically in Fig. 10.

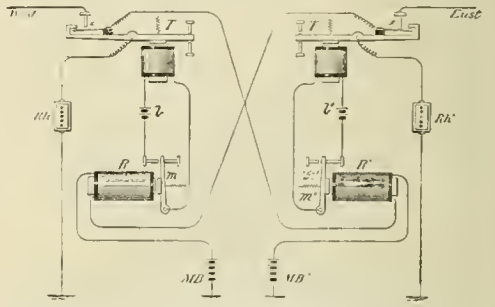
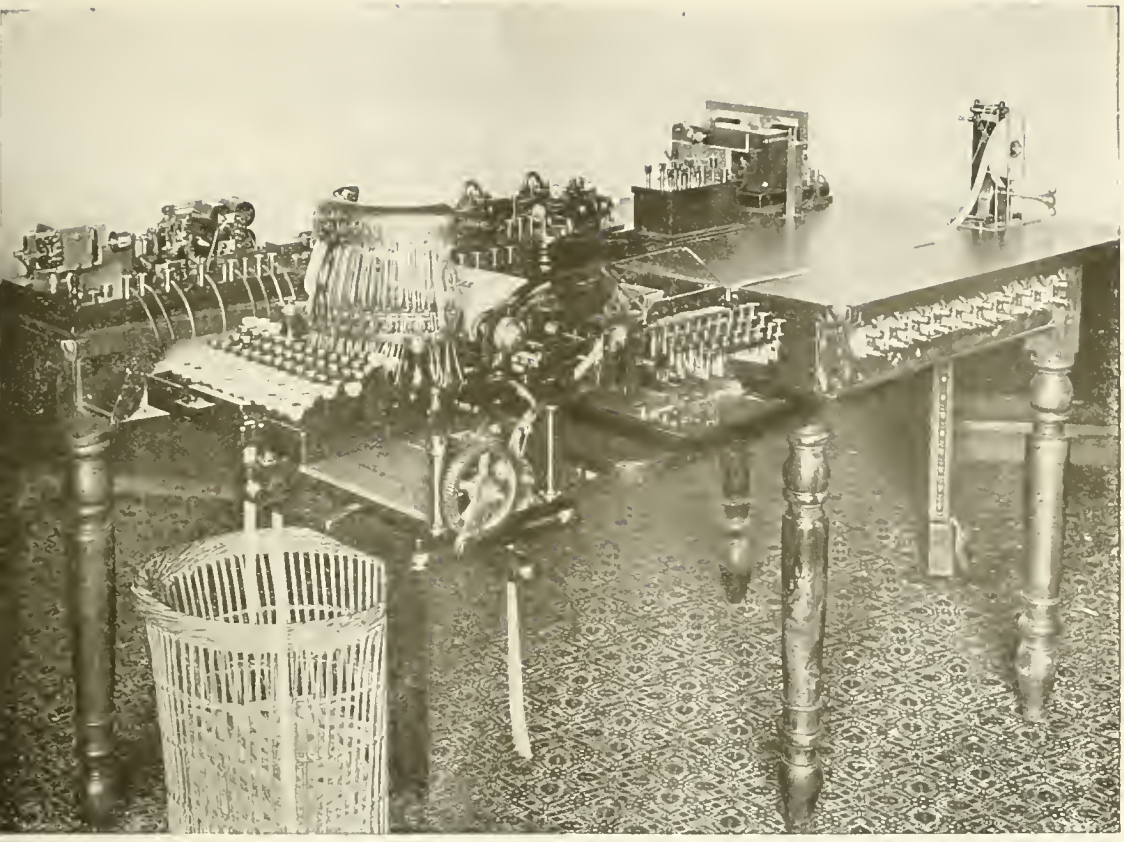
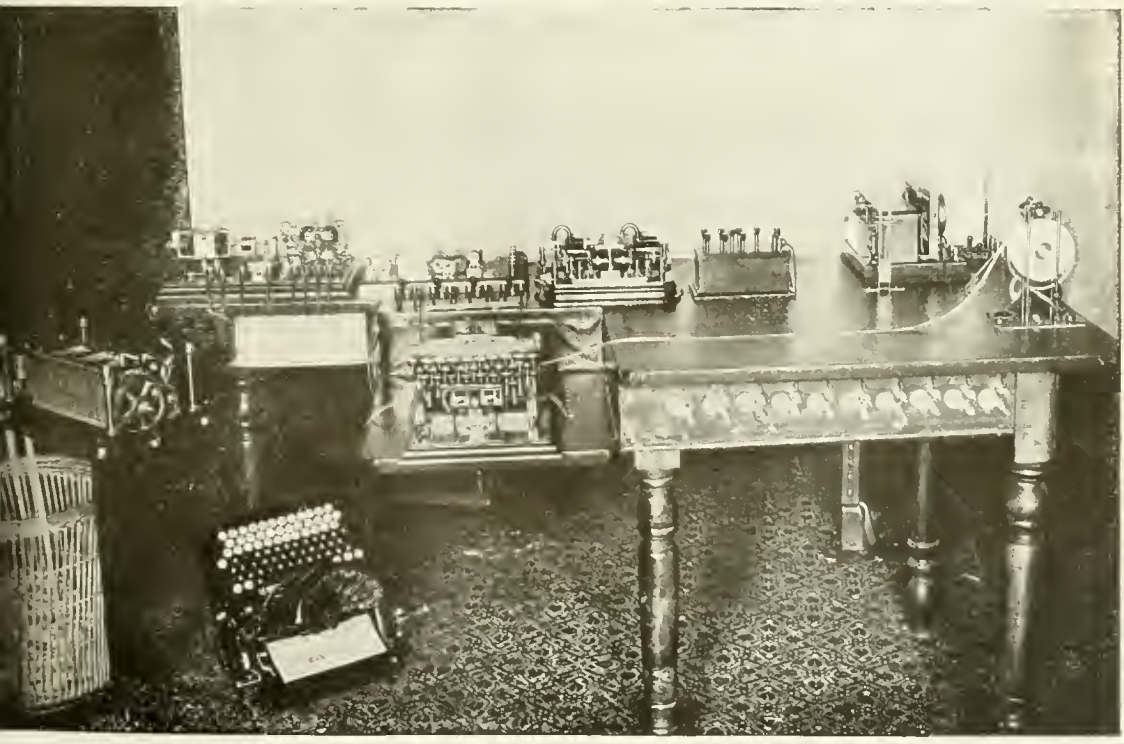


Fig. 19. The Toye Repeater.

This is known as the "Toye" repeater, which was at one time much in use, and is chosen for illustration because of its comparative simplicity. It may be noticed that relay R controls the "continuity preserving" transmitter T by means of its armature lever *m*, and local battery *b;* while relay R′ controls T′ by means of lever *m′* and battery *b′*. Also that transmitter T controls the western main circuit at *x;* while T′ controls the eastern circuit at *x′*. In practice T′ is the "opposite" transmitter to relay R, and T is the "opposite" transmitter to R′. In the operation of an automatic repeater the desideratum is automatically to keep the "opposite" transmitter passive while its circuit is being repeated into, in shop phrase. The operation of the Toye repeater is as follows: Assume that the East is sending to the West. When the eastern operator opens his key, thereby opening the eastern circuit, relay R opens, as in the figure. This opens transmitter T, and in consequence the western circuit is opened at *x*. At the instant, however, that the western circuit is opened at *x*, the circuit which includes the relay R′ and main battery MB′ is closed via the lever of T, through a resistance Rh equal to that of the eastern circuit. As this transposition or substitution of circuits maintains the current passing through relay R′ at the same strength as before the change of circuits was made that relay, and, consequently, the transmitter T′ remain closed. In this way the "opposite" transmitter is au-



SHOWING BOTH THE SENDING AND RECEIVING INSTRUMENTS.



THE MURRAY PAGE-PRINTING TELEGRAPH.

The automatic receiving and writing instrument in the centre, the sender on the floor

tomatically kept passive. When the eastern operator again closes his key, relay R, and in turn T, are likewise closed, resulting in the closing of the western circuit at *x*. When the west sends to the east the described actions are reversed.

Among the other automatic repeaters now in use may be mentioned, the Milliken, the Neilson, the Weiny, the Maver-Gardanier, the Atkinson, the Ghegan and the Varley.

Automatic Telegraph Systems.— Automatic telegraphy consists of arrangements of apparatus whereby Morse characters are transmitted at a rate of speed ranging from 80 to 2,000 or 3,000 words per minute. As the rate of speed by hand transmission of Morse characters is from, say, 15 to 40 words per minute, it is obvious that by the use of a rapid automatic system many more messages may be transmitted over one wire in a given time than by the manual method; and since the cost of construction and maintenance of the wires is a large portion of the expense of a telegraph equipment, if everything else were equal, the advantage would be largely in favor of the automatic systems. But, as frequently happens, everything else is not equal. In the first place, every message sent by an automatic Morse system has to be manually prepared for transmission by the automatic machinery, and every message received must be transcribed manually before its delivery to the addressee. This involves a larger force of operatives than is necessary to handle an equal number of messages manually. There is also greater delay in the handling of a message by reason of the additional number of clerks through whose hands it must pass. There is for the same and other reasons greater liability to errors by automatic transmission than by manual transmission. Nevertheless certain automatic systems, like the Wheatstone, for instance, are found of much utility.

There are two general types of automatic telegraph systems, namely, chemical automatic and ink recording, or embossing, automatic systems. The former relates to systems in which electrochemical action produces the records of the signals, the latter to systems in which, as the term implies, the signals are recorded by ink recorders.

Chemical Automatic Telegraphs.— At one time in Europe and in the United States chemical automatic telegraph systems were largely employed in commercial telegraphy, but at the present time its use is confined almost exclusively to recording signals in police, fire alarm, and similar systems. See ELECTRIC SIGNALING. The message for transmission by chemical telegraphy is usually prepared by perforating in a paper strip holes corresponding to the characters of the Morse alphabet. This strip is then drawn over a metal roller on which rests a steel needle or brush; the needles and the roller being made a part of the circuit in which there is a primary battery or other suitable source of electromotive force. As the paper is drawn along, the needle, or brush, drops into the holes in the paper, making contact with the roller and completing the circuit. In this way current pulsations corresponding in duration to dots and dashes are sent over the wire. At the receiving station there is a practically similar arrangement, except that the perforated paper is not used, but, instead, a strip of paper that has been immersed in a chemical solution is drawn over a roller.

The principle involved in the operation of chemical telegraphy is that of the decomposition of the electrolyte carried in the moistened paper, and through which the current is caused to pass. For example, if the paper be saturated with a solution of potassic iodide dissolved in water, the action of the current will separate the iodine from the potassium, when the iodine will appear on the paper as a brown line, or brown dots and dashes. Or if the solution employed be one containing potassic iodide, and starch dissolved in water, the action of the current will set free the iodine, which, combining with the elements of the starch, produces blue marks on the paper. Other solutions produce different effects, for instance, a combination of prussiate of potash, 5 parts; ammonic nitrate, 150 parts, and water, 10 parts, from which, under the action of the electric current cyanogen is liberated and attacks the iron of the needle, producing enduring blue marks on the paper.

Speeds of 2,000 words per minute have been attained by automatic chemical systems over wires 200 miles in length. Errors due to the tearing of the damp paper, to temporary troubles on the line which might cause dozens of messages to be dropped out, and other causes have acted adversely to the permanent employment of such systems in commercial telegraphy.

Wheatstone Automatic Telegraph.— This is an ink recording system. Its apparatus consists of a *perforating machine* by which messages are prepared for transmission; a *transmitter* which utilizes the perforated paper to transmit messages thus prepared, and a *receiver* which, being actuated by the electrical pulsations set up by the transmitter, records them in ink, on stiff paper tape, as dots and dashes. The *perforator* consists of small hollow cylinders with keen edges, in close proximity to which the paper to be perforated is caused to pass. Three discs, connected with these cylinders, and representing the dot, dash and space, are depressed by the stroke of a mallet in the hands of an operator, with the result that holes of a certain order are punched in the paper. Thus when the dot disc is depressed, three vertical holes are cut; when the dash disc is depressed two vertical and two horizontal holes are cut, and when the space disc is depressed one central hole is cut, virtually as shown at the left of Fig. 11. The *transmitter* in its operation takes the place of the operator's hand and formulates dots and dashes with an accuracy superior to and at a speed 10 to 15 times greater than the most expert operator can attain. That portion of the transmitter apparatus actually employed in transmitting signals is outlined in Fig. 11. L′ L are vertical rods attached at their lower ends to crank-levers A′ A, respectively. By means of adjusting screws F, F, L′ is set to the left of L a distance equal to the

space between any two horizontal central holes in the paper. The crank-levers are provided with horizontal connecting rods H, H′, the right ends of which pass through holes in a centrally pivoted lever M, and through supporting sleeves x' $x°$. H, H′ are provided with collets C, C′ which at certain times alternately engage with ends P′, D of lever M and push them over. The springs s s give the rods L L′ a constant tendency upward, but their upward motion is checked by the pins R′ R on the rocking beam V, which by suitable mechanism within the box on which the apparatus is supported is given a rocking motion. When the right end of the beam moves upward the spring s' causes rod L to follow pin R, and at the same time the connecting rod H pushes the strip P′ on M against the upper contact 2 on a metal strip N; while concurrently the end D of M is brought into contact with the lower contact 3 on a metal strip P. The positive pole of a battery B is brought to strip P, the negative pole to strip N. The "ground" is connected with the lower end D of M; the line wire to the upper end P′; D and P′ being insulated from one another. The lever M is really a pole-changing key and the rods and levers simply displace the operator's fingers, causing that key to reverse the poles of the battery. In the present position of M in the figure the negative pole of the battery is placed to the line. The perforated paper is shown by a single line and the rod L has passed through a hole in the paper. A revolving star-wheel W meshes with the central rows of holes in the paper and draws it along at a uniform rate of speed. Assuming there is another hole in the paper immediately opposite that one through which L has just passed, when the lever L′ moves upward it will pass through that hole, the paper having been moved forward by the star-wheel just enough to bring the hole opposite L′. At the same time, by the downward motion of L the collet C has been withdrawn, giving collet C′ on H′ free scope to push D against its right contact, 4, and P′ against the contact 7, which it will be seen reverses the polarity of the battery to line. If a succession of dot holes were punched on the paper, a succession of short positive and negative currents would pass over the line. When, however, a set of diagonal holes, as at Y in Fig. 11, are punched on the paper, the result is different, for at the first upward movement of L it will pass through the hole, pushing end P′ of M to the right, but at the following upward movement of L′ it meets the paper at a point opposite the hole through which L had just passed and its further upward motion is arrested. Hence, M is not pushed over and the battery is not reversed. At the next upward movement of L its motion is similarly arrested and the polarity of the battery is still unchanged, until at the next upward movement of L′ it comes opposite and passes through the hole M, causing the collet C′ to push D against contact 4, thereby reversing the poles of the battery to line. This delay in the reversal of the battery is sufficient to make an appreciable difference in the length of the signal recorded, and constitutes a dash. The effect of these different actions is that, depending on the position of the perforations in the paper strip, dots and dashes are transmitted by the pole-changer M.

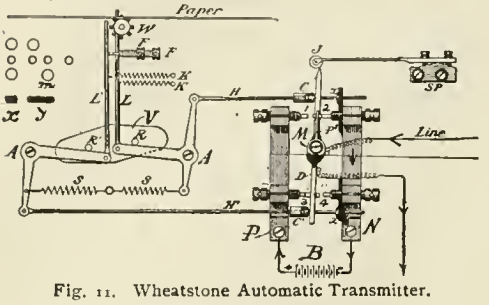


Fig. 11. Wheatstone Automatic Transmitter.

The Wheatstone automatic receiver, or ink recorder, consists of a polarized relay (see Polar Duplex in this article), the armature lever of which is extended at a right angle at its upper end, and this extension at certain times is caused to impinge against a light rod pivoted at one end. On the end of this rod is a small circular disc the lower portion of whose periphery is immersed in an ink well; an upper portion of its periphery is placed very near the stiff paper tape previously mentioned. The axle of this disc is given a slight tension away from the paper. When, however, a current of positive polarity, designed to record a dot or dash on the paper, actuates the polarized relay, its extended armature lever presses against the axle of the disc causing it to deposit a mark on the moving paper tape. A negative current causes the withdrawal of the disc from the paper. The positive current in this system is termed a "marking" current; the negative current a "spacing" current, when it is operated by the "double current" or reversal of polarity method; to which further reference will be made in connection with "Duplex Telegraphy," also in this article. The circular disc is kept in rotation by simple clock-work mechanism and thus constantly renews its supply of ink. The paper strip is drawn forward at a desired rate by rollers operated by mechanism within the box.

The Wheatstone automatic telegraph may be worked duplex by using a differentially wound relay and the other necessary apparatus of a duplex system. When worked as a duplex it gives a wire of moderate length, in which there are no very long submarine or underground cables, a capacity of from 200 to 350 words in each direction. On a 1,000-mile duplex circuit such as from New York to Chicago with one repeater station at Buffalo, a speed of about 125 words per minute in each direction is now obtainable.

Writing Telegraph Systems.— Writing or autographic telegraph systems transmit and record facsimiles of letters or characters while they are being formed by the stylus or pen in the hand of the operator. The first to produce a writing telegraph system was probably Mr. A. E. Cowper, of England, who employed in the operation of his system the

principle of the parallelogram of forces, whereby by compounding the movements of a point in two directions, the one at an angle to the other, the actual movement of the point is the resultant of the two movements. The Telautograph (q.v.) also operates on this principle. In the Cowper system the receiving pen depends for its movements upon variations of the magnetism of two electromagnets placed at right angles to one another, which variations produce changes in their magnetic fields, to which changes an armature carrying the receiving pen is free to respond. The magnets are placed in separate circuits. The variations in the magnetic strength of the magnets are caused by variations of the current strength in their circuits which variations are brought about by means of a pencil which when moved by the operator in the act of writing is caused to switch resistance coils in and out of the respective circuits.

Automatic Facsimile Telegraphy.— This art relates to the transmission and reproduction of characters or pictures electrically. This may be done by electrochemical or electromagnetic methods. In electrochemical methods the characters or pictures to be transmitted are as a rule inscribed with an insulating ink upon a strip of tin foil. The tin foil is connected in a circuit with a battery practically as in the case of the chemical automatic transmitters (q.v.). At the receiving station a sheet or strip of chemically treated paper is used. At each station a stylus is caused to move back and forth, rapidly across the metal foil, and the chemical paper, synchronously, and current pulsations of a duration corresponding to the extent of uninsulated surface of the tin foil over which the transmitting stylus may be passing are transmitted over the wire. The foil and the paper sheets being moved forward at a uniform rate, the result is that marks and characters corresponding in appearance to those on the metal foil are reproduced on the chemically prepared sheet.

In electromagnetic methods the pictures to be transmitted are embossed on a piece of cardboard which is then placed on a suitable cylinder. A similar blank card is arranged on a cylinder at the receiving station. The cylinders are rotated at a given rate and are moved lengthwise at the same time. A light lever controlling the contact points of the line circuit is placed over the transmitting card with the result that in the operation of the cylinder the lever is raised and lowered by the embossings, thereby opening and closing the circuit. The arrangement at the receiving end is such that when the circuit is open a pen attached to the armature of an electromagnet in the circuit rests on the card; while, when the circuit is closed, the armature is attracted and the pen is lifted from the card. Hence the marks and breaks at the transmitting end result in reproducing in ink on the receiving card a facsimile of the characters on the transmitting card.

Duplex Telegraphy.— This consists in the sending of two messages over one wire in opposite directions at the same time. It is sometimes termed contraplex telegraphy. Since on an ordinary Morse telegraph circuit it is not possible to send more than one message at a time over a wire, it is essential, in order to make duplex telegraphy possible, that the signals transmitted from the sending station shall not interfere with the signals to be received at that station. The receiving instruments must therefore be so constructed or so placed that while ready to respond to all signals from the distant station they shall not respond to signals from the near or home station. These requirements are met in two ways in practice; one method being known as the "differential," the other as the "bridge" method. The differential plan is used almost exclusively on land line duplex telegraphy; the bridge plan is utilized exclusively on long submarine cable telegraphy. The "differential" plan avails of the fact that if a soft iron bar or core, B Fig. 12, be wound with

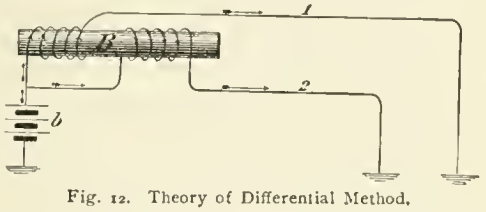


Fig. 12. Theory of Differential Method.

two coils of wire,— oppositely wound as shown — a current from a battery *b* will flow in opposite directions around the iron bar, and as each current tends to set up opposite magnetic poles in the iron, one current will neutralize the other and no magnetic effects will be produced in the core. If, however, another battery or source of electromotive force should be placed in the circuit of wire 1 at its distant or right-hand end, a greater amount of current will flow in coil 1 than in coil 2, and in consequence the core will be magnetized, to a degree depending on the difference in the strength of currents flowing in the respective coils; hence the term differential, and a relay wound in this way is termed a differential relay. The theory of the "bridge" plan is outlined in Fig. 13.

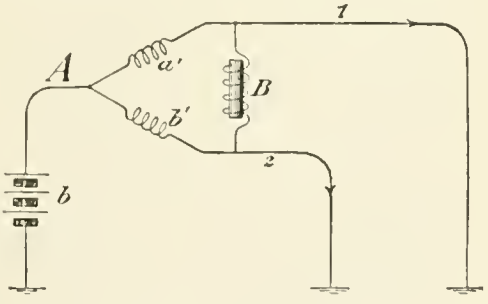


Fig. 13. Theory of Bridge Duplex.

The battery, and wires 1 and 2 remain as before, but the iron bar B is now connected between them, and is wound with but one coil. *a'*, *b'* are coils of resistance, termed the

arms of the "bridge" (Wheatstone bridge). Assuming the resistance of wires *a'*, *b'*, and wires 1 and 2 to be equal, the electric pressure due to battery *b*, at the terminals of the bridge wire, will be equal and opposite, and hence no current will flow in the bridge wire. A mechanical illustration may make this clear. Assume battery *b* in the figure to be a water pump; wires *a'*, 1 and *b'*, 2, to be parallel water pipes of equal diameter and length, and connected at a distance from *b* by a pipe B. If then the pump *b* force water through the parallel pipes no water will flow through B, inasmuch as the water pressure at its ends is equal, and opposite in direction. If by any means, as by placing a suction pump at the far end of 1, a difference in the pressure is caused at the ends of the bridge pipe a current of water will now flow through it from the point of higher to the point of lower water pressure. Analogously if a battery be placed in the circuit at the far end of wire 1 it will cause the potential or pressure at the terminus of the bridge wire to vary and current will flow from higher to lower pressure in the bridge wire.

There are two systems of duplex telegraphy in use in this country and elsewhere, namely, the "Stearns" duplex and the "Polar" duplex, and these combined comprise the Edison "Quadruplex", described later.

The Stearns Duplex.— The Stearns duplex is operated by increment and decrement of current on the line, virtually as the single Morse system is operated, namely, by sending a current over the line to actuate the distant relay, which attracts its armature; and by removing the current from the line, whereupon the armature is withdrawn by its retractile spring. The near or home battery is prevented from affecting the near relay by winding the relays differentially. The theory of the Stearns duplex is shown in Fig. 14,

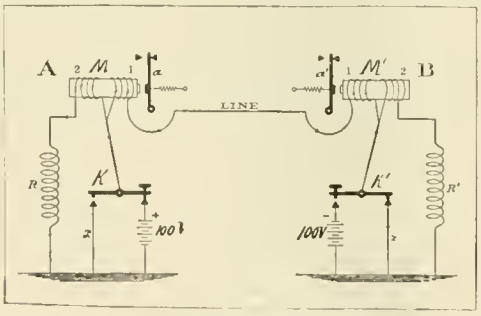


Fig. 14. Theory of Stearns' Duplex.

which represents the apparatus at two stations A and B. The relays M, M', are wound with two coils, in opposite directions around the cores; one of the coils of each relay being connected to the main line and the other to a rheostat, or resistance coils, R, R'. K and K' are transmitting keys. When key K is closed it puts a positive electromotive force to the line; when key K' is closed it puts a negative electromotive force to the line. When the keys are "open" the line wire is placed to ground. Since the battery current will divide between the two coils of the relay in proportion to the resistance of the circuits attached to each coil, a means must be provided to make those circuits of equal resistance, otherwise unequal currents will flow through the coils, and the relays will be operated by the home battery. This would be inimical to the operation of this type of duplex telegraphy. It is the function of the rheostats R to provide a resistance equal to that of the main line and the main line coil 1, of the distant relay, so that there will be a "balance." Thus, for example, if the resistance of the line be 1,000 ohms and the resistance of one coil of the relay be 200 ohms, a resistance of 1,200 ohms will be necessary in each rheostat. In the figure, key K being closed, and key K' open, a current flows as indicated by the arrows from A to B. As equal currents are flowing in opposite directions around the core of relay M its armature is not attracted. On the other hand, as there is a direct path for the current at B to earth, via the back contact of key K', no current from A will flow through coil 2 of relay M'. Consequently, the core of M' is magnetized and attracts its armature *a'* as shown. If now key K' should be closed this would add 100 volts negative polarity to the main line circuit, making 200 volts on the main line, while it would place only 100 volts to the artificial line coil at B. Hence double the amount of current will flow in the line coils 1, of each relay, that flows through the artificial line coils 1 and 2. Thus the armature *a'* of M' is now attracted and armature *a* of M continues to be attracted. By these arrangements the prime requirements of a duplex system are met. That is, the home relay is not affected by the near battery, and yet it is in the circuit ready to be operated by the distant battery. Therefore, as the home battery does not affect the home relay, it follows that messages may be sent from each near end to the distant end at pleasure.

The Polar Duplex.— This system also employs differentially wound relays, transmitting keys and main and artificial lines similar to those of the Stearns duplex and for the same purposes, but the type of transmitting keys and relays is different in the two systems.

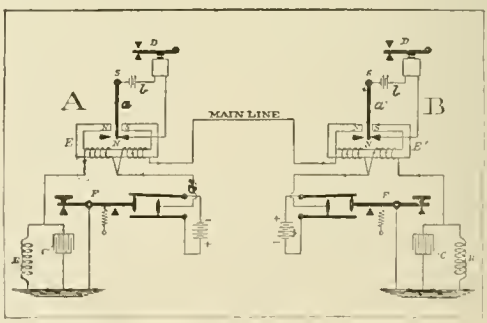


Fig. 15. Theory of Polar Duplex.

The relay employed in this system is termed a polarized relay (E, E', Fig. 15) and is based on the fact that unlike magnetic

poles attract one another, and that like poles repel one another. Then if one pole of a bar permanent magnet *a*, say its north pole N, be so pivoted that it may move freely toward the south pole S of an electromagnet E, it will follow that by changing the direction of the current flowing in the coils of the electromagnet, the permanent magnet *a* will oscillate between the poles in response to the changes of polarity in the electromagnet. If the permanent magnet *a*, which is virtually the armature of a polarized relay, be given control of a local circuit containing a sounder D and battery *b*, it may be caused to record signals in a manner practically similar to that in which the Stearns' relay records them. It is only necessary to provide a pole-changing key F F′ to reverse the direction of the current flowing in the line, to bring about this result. Fig. 15 represents in theory the circuits and apparatus of a differential polar duplex; the apparatus and arrangement of circuits at the terminal stations, A and B, being indicated. When the "pole-changer" F is "closed" as at A a positive pole of a battery is placed to the line and the direction of the current is as indicated by the arrows. When the key F′ at B is closed, a negative pole of a battery is placed to the line. In these positions of the keys the direction of the currents in the main and artificial lines is as shown by the arrows, and the relays at both ends of the line are recording a signal, the sounders being attracted. This is due to the fact that an excess of current is flowing in the line coils of each relay in a direction to produce magnetic poles in the cores of the relays as marked. If now, for instance, the key F′ at B should be opened the effect would be to place a positive pole of the battery to the line. The effect of this is that each end of the main line is placed at equal and like potentials and hence no current flows over the main line or in the main line coils of the relays. A positive current from the battery at A with a strength of say, I, will still flow through the artificial line coil at A, but in a direction which will reverse the previous polarity of the core; consequently the armature *a* of the relay is attracted to the left side and the local circuit of sounder D is opened. It might be thought at first sight that as the battery at B has been reversed, and in consequence the excess of current in the line coil of relay E′ has been abruptly removed, its magnetic polarity might be reversed without the intervention of the distant pole-changer F, which, being closed, is still in the position in which the sounder at B should be kept closed. That the polarity of E′ is not reversed is due to the fact that while the flow of current in the main line coil has ceased, there is now a magnetizing current flowing in the artificial line coil of E′ which is in a direction around the core similar to that in which the previous excess current was flowing around the core, and, therefore, the magnetism of the core at B remains unaltered. An examination of the conditions will show in every case that when the pole-changer at either end is opened or closed, the local circuits controlled by the armature of the distant relays will also be "opened" or "closed." From which it follows that dots and dashes may be transmitted from both ends of the line simultaneously by a proper manipulation of the pole changers.

The instrument C C shown at A and B is an electrical condenser (q.v.). It performs a very useful function in duplex and quadruplex telegraphy, as follows. The artificial line coils R R which are used to "balance" with are usually composed of spools of fine German silver wire, wound double, or non-inductively, so that they may not possess any perceptible magnetic effect or inductance. These coils have no static capacity. The main line it is known does possess static capacity. Hence at the moment of charging and discharging the line there is a momentary inrush and outrush of current into and from the line, greater than that due to the ohmic resistance of the line. This would produce a momentary inequality in the current in the coils of the relays unless equal capacity were given to the artificial line. This is done by adding the condensers C C to the artificial line. These condensers are adjustable and by means of metal plugs more or less capacity may be added until a static balance is obtained. The rheostats are also adjustable in order that the resistance balance may be readily obtained.

The arrangement of pole reversing keys and polarized relays shown herein may also be used for single wire working and in fact this method has been largely used in Europe where it is known as the "double current" method.

The Quadruplex (Edison).— It will be observed that the Stearns duplex and the polar duplex employ in their operation two distinctly different principles. The Stearns duplex depends for its operation upon the increase or decrease of the strength of current on the line, regardless of the direction (polarity) of the current whilst the polar duplex depends upon changes in the direction of the current regardless of current strength. In the operation of the Edison quadruplex system both of these principles are combined on one wire; the instruments used being the transmitting key (transmitter) and Morse relay (termed the neutral relay) of the Stearns duplex, and the pole-changer and polarized relay of the polar duplex.

It being understood that the relays are wound differentially for the purpose stated previously and that rheostats, condensers, etc., are employed, as in the duplex systems described, the theory of the quadruplex system will be easily grasped by reference to Fig. 16. In the Stearns duplex, when the transmitter is open there is no electromotive force to the line, the wire in that case being placed directly to ground. Since the polar duplex depends for its operation upon the reversal of polarity, provision is made for this requirement in the quadruplex by so arranging the connections of the transmitter K, that when the latter is "open" a small portion, I, of battery B is left in the circuit, to be operated by the pole-changer PC. When K is closed, the full battery B is reversed by the pole-changer. On the other hand, when the small portion I of battery B is to the line, and

only a weak current is traversing the line, the adjustment of the retractile spring is such

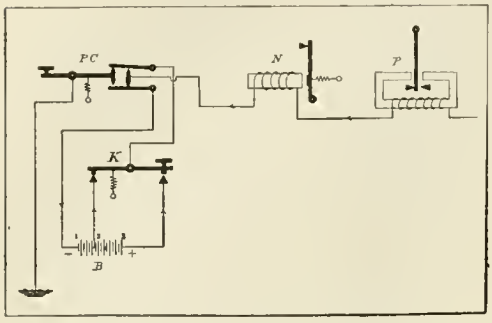


Fig. 16. Theory of Edison Quadruplex

that the armature *a* is withdrawn from the core; while, when the key K is closed, and the full strength of battery passes to line, the armature is attracted. Both stations are of course similarly equipped. Thus an operator may manipulate key K and the consequent increase and decrease in the current strength will operate the distant neutral relay N. But the operation of key K will not practically affect the distant polarized relay P, inasmuch as that key does not alter the direction of current on the line. On the other hand the pole-changer PC will operate the distant polarized relay, but will not operate the distant neutral relay. Thus two messages may be sent in opposite directions at once over a quadruplex circuit; this system therefore giving the equivalent of four wires from one. The three wires thus gained are termed "phantom" wires. The Edison quadruplex has been widely employed in the United States, Canada, and Great Britain.

Many details of apparatus required in practice are, for lack of space, omitted here, but those interested will find complete details of these systems in the author's 'American Telegraphy and Encyclopedia of the Telegraph,' from which work a number of the diagrams used in this article are reproduced with the consent of the publishers.

The Roberson Quadruplex.— This is a modification of the "Sieurs" quadruplex. It employs at the transmitting end two keys — one of which controls a train of rapidly-pulsating currents of positive polarity, the other controls rapidly-pulsating currents of negative polarity. At the receiving end there are two polarized relays — one of which is arranged to respond only to positive pulsations; the other to negative pulsations only. Each relay is provided with a contact that controls a sounder. The relays are wound differentially and rheostats and condensers are used for the artificial line. This quadruplex is used to a limited extent in the United States and is found to give satisfactory service on long circuits, especially in stormy weather.

Submarine Cable Telegraphy.— The speed of signaling through an electrical conductor is inversely proportional to the product of its electrostatic capacity and the resistance. The capacity and resistance of a conductor increases directly with its length. The capacity also varies with the material comprising the insulating medium (see ELECTRIC CONDENSER). The high electrostatic capacity and the great length of submarine cables conduce to slow signaling. When a long cable is connected with a source of electromotive force the charge is communicated to the distant end almost immediately, but the amount of charge at first arriving is extremely small and the charge or current rises slowly thereafter to its maximum. The discharge is approximately as gradual as the charge. Hence a desideratum in submarine telegraphy is a receiving instrument that will respond to a very feeble current, for the weaker the current required the shorter will be the time of charging and discharging the cable, and the more rapid will be the rate of signaling. The first most successful receiving instrument devised for this work was the Thomson mirror galvanometer (see GALVANOMETER). The light from a lamp is thrown upon the mirror and the light is reflected back upon a screen. The mirror is carried on a suspension system including several very small magnetic needles, which are in the centre of a coil of fine wire, the coil being in the circuit of the cable. Minute pulsations of current cause the needles to be deflected to the right or left according to the direction of the currents. This causes the spot of light on the screen to be deflected to the right or left. A deflection to the right constitutes a dash, one to the left a dot. The direction of the deflections is regulated by a special form of key (K, Fig. 17) at the sending end (a tapper) by means of which positive and negative currents may be transmitted. The mirror receiver gives no record of the message, the signals being written down by the operator as they are received.

A later invention, the Siphon recorder, also due to Sir Wm. Thomson (now Lord Kelvin) overcomes this objection. This instrument, outlined in Fig. 17, consists of a

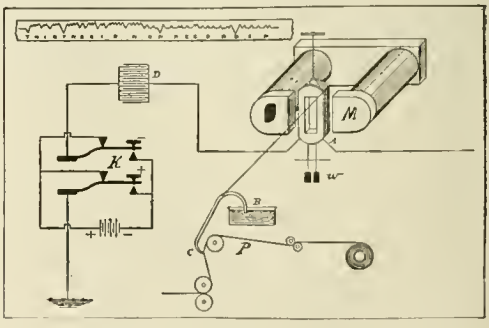


Fig. 17. Theory of Submarine Cable Telegraphy.

coil of fine copper wire, A, which is suspended between the poles of a powerful magnet, M, in such a manner that when a current passes through the coil it, like the needles in the mirror galvanometer, tends to place itself at right angles to the lines of force of the magnetic field. When no current is flowing in the coil, two small weights, *w*, suspended from the lower end of the coil, hold it

in the plane of the magnetic lines of force of the magnet. A siphon C consisting of a very small glass tube is attached to the coil by a fine wire. The lower and bent end of the siphon is placed directly over the centre, or imaginery zero, of a paper ribbon P. The double pole-changing key K sets up momentary pulsations of positive and negative currents through the coil, the movements of which cause the lower end of the siphon to move to one side or other of the zero line of the paper. The upper end of the siphon dips in an ink-well B, and, by an ingenious electrical arrangement, not shown in the figure, the ink is caused to spurt out at the lower end of the siphon upon the paper strip as a succession of very fine dots. Thus it is not needful that the siphon should touch the paper and in this way friction is avoided. A specimen of the signals as recorded by the siphon recorder is shown at the top of the figure.

For reasons not well known the earth's electric potential varies at different parts of the earth. Hence there is usually a difference of potential between the terminals of a long cable. This would tend to produce a current in a sensitive receiving instrument, which would deflect it to the detriment of signaling. To avoid this difficulty a condenser D is placed between the cable and the earth. This, so to speak, breaks the continuity of the circuit for slow changes of potential. When the condenser is once charged with the earth's potential, current ceases to flow into the cable and the receiving instrument comes to zero. The changes in the earth's potential occur comparatively slowly — from maximum positive to negative in perhaps five minutes. Consequently these changes are scarcely perceptible on the receiving instrument. The quick changes of potential due to the transmitter, however, produce currents of charge and discharge that operate that instrument.

Long submarine cables are usually duplexed; the "bridge" method of preventing the effect of the home transmitting key upon the home receiving instruments, being employed. An artificial cable consisting of strips of tin foil arranged to give resistance and capacity equal to the actual cable is employed instead of the rheostats and condenser used for the artificial line in overland duplex telegraphy.

Signals are now usually transmitted over long submarine cables by automatic transmitters somewhat similar to the Wheatstone transmitter; the messages being perforated in advance on a strip of paper. A speed of about 40 words per minute in each direction is reached on some of the newer Atlantic cables.

Simultaneous Telegraphy and Telephony.— This is sometimes termed "composite telegraphy." The art relates to telegraphing and telephoning over one wire at the one time.

When a telephone receiver is inserted in an ordinary telegraph circuit the operation of the Morse keys deflects the diaphragm abruptly and produces loud noises in the telephone which render the reception of speech nearly impossible. Van Rysselberghe, of Belgium, discovered that if the rise and fall of the telegraph currents were made gradual no disturbing sounds would be heard in the telephone. To bring about this result he introduced into the telegraph circuit a combination of electromagnets and condensers, which by retarding the rise and prolonging the fall of the telegraph currents merely inflect the diaphragm of the telephone, but do not produce any sound thereby. When this result is obtained the telephone currents may then be superposed upon the telegraph currents without impairing the efficiency of the telegraph signals. Simultaneous telegraphy and telephony is now in successful use in America and Europe; two telegraph circuits being operated as one telephone metallic (two wire) circuit, on circuits up to 400 miles in length.

Synchronous Multiplex Telegraphy.— It is known that 500 pulsations of electricity per second can be transmitted on an overhead wire of moderate length. A telegraph operator at his best speed is not capable of transmitting more than an average of 10 dots per second. Hence it was thought that if means were devised whereby a number of operators should consecutively be given exclusive control of a wire for brief intervals of time the same wire might be utilized to transmit four, six or more messages at practically the same time. In order that this might be done satisfactorily it was evident that the corresponding transmitting and receiving instruments at the near and distant stations should be placed in connection with the wire at identical instants. This entailed the construction of devices for obtaining exact synchronism; hence the name of the system.

The apparatus for obtaining synchronism and for apportioning the wire among a number of operators consists of a revolving wheel at each end of the telegraph line, the wheels revolving as nearly as possible at a uniform rate. Each wheel is driven by an electric motor whose motion is controlled by a vibrating reed at each station, which reeds are attuned to the same rate of vibration, as closely as possible. This wheel is supported on a vertical shaft. Below it is a stationery circular disc made up chiefly of a large number of metal segments (84) radiating from near the centre of the disc, and insulated from one another by suitable material. The shaft supporting the wheel passes through the centre of the disc. The shaft carries by a suitable projection a brush or trailer, which, as the wheel revolves, is swept over the segments in rapid succession. As the trailer makes three revolutions per second it comes in contact with each segment three times per second. If it is desired to transmit six messages at once, 72 segments are set apart for the purpose, and each of six desks at each end of the wire are allotted twelve segments. That is, starting from any given point on the disc, the first segment will be given to desk No. 1; the second segment to desk No. 2, and so on to the sixth segment, where two segments are skipped, being reserved for synchronizing purposes. A second series of six segments is then connected to desks No.'s 1, 2, 3, and so on around the disc. The line wire is connected to the

shaft or trailer of the revolving wheel at each station, and, consequently, as the trailers make three revolutions per second, each desk of the six is placed in contact with the line, and with its corresponding desk at the distant station, 36 times per second. As an operator cannot make a dot in less than the one-twelfth of a second it follows that in that time the trailer will have given him contact with the line thrice. Hence each one of six operators may transmit messages as though he had entire control of the line. As each character received at any one desk is formed of a number of pulsations an arrangement of relays with a contact on the "back-stop" is employed which delivers the signals virtually unbroken at the receiving end. Synchronism is maintained by means of the two segments referred to which send "correcting" impulses that retard or accelerate the speed of the wheel that carries the trailer.

A multiplex system of this general type, due to Mr. P. B. Delany, of New York, and bearing his name, is in operation in Great Britain on a number of circuits.

Harmonic Telegraph.— This system, due to Professor Elisha Gray, avails of the fact that a steel rod or tuning fork has a fundamental rate of vibration depending on its physical formation. Forks attuned to different rates of vibration are caused by suitable contacts to open and close main line batteries at the transmitting end of a main line circuit, at a rate depending on their fundamental rate of vibration. These forks are maintained in vibration by well-known electromagnetic devices akin to that of the electric door-bell (see ELECTRIC SIGNALING). When so vibrating these forks send out current pulsations corresponding to their rate of vibration except when their contact points are shunted or opened by a suitable Morse key in the hands of an operator.

At the receiving station electromagnets are placed in the main line. The armatures of the electromagnets consist of reeds fastened at one end and attuned to vibrate at rates corresponding with their corresponding transmitting forks; and each reed will respond only to its corresponding fork. Each of the reeds is equipped with a light lever which rides on the top of the reed. This rider controls a local circuit in which there is an ordinary Morse sounder. By this means signals transmitted by any one or all of the transmitting operators will be received by the respective receiving operator or operators. In practice four messages have been transmitted at once by this system between New York and Chicago.

Dial Telegraphs.—Variously known as dial, A, B, C, and pointer telegraph systems; due to Breguet, Kramer, Frischen, Wheatstone and Siemens-Halske. These systems employ a dial carrying on an outer circle the letters of the alphabet and on an inner circle figures and punctuation marks. A pointer operated by suitable mechanism within a case moves like the minute hand of a clock around the dial in response to pulsations of electricity from a sending instrument. The sending instrument has a similar dial and is equipped with a key which is movable around the face of the dial. As the key is thus moved it opens or closes a circuit, or it causes the movement of a magnet before coils of wire within the case, that transmits pulsations of electricity over the line, which in turn actuate, by means of an electromagnet, an escape wheel that moves the pointer as stated. The operator moves the transmitting key uniformly around the dial. As he does so the pointer on the receiving instrument moves a corresponding distance. When the key arrives at a desired letter the operator pauses. The receiving operator or attendant notes the letter; the sender moves his key to the next desired letter, and so on, in this manner spelling out his message. This system is slow, but it possesses the advantage of requiring little or no skill on the part of the user for its operation. Hence, especially before the days of the telephone, it was in favor as a means of communication between police and fire headquarters, on railroads, etc. As elsewhere stated telegraphs of this order are still in use in other countries.

Pollak-Virag Automatic Telegraph.— In one of its first forms this system employed a perforated tape, the holes on one edge of the paper transmitting dots, those on the other edge, dashes; the paper passes between two metal brushes and a metal cylinder; one brush transmitting positive, the other negative polarity. The receiver is a telephone attached to the centre of the diaphragm of which is a light metal rod. The current pulsations oscillate the diaphragm which oscillations are communicated by the rod to a small mirror. A beam of light is thrown from a lamp upon the mirror which in turn reflects the light through a slot upon a roll of sensitive photographic paper, the result being that dots and dashes are produced on the paper roll.

In a later development of the system an operator perforates a paper strip, by means of a keyboard, with an arbitrary number of holes for each letter; the number of holes for one letter being in some cases more than 12, and occupying a space of about seven-eighths of an inch on the strip. The strip is passed between metallic brushes and a drum, causing intermittent currents to pass over two wires to the distant station, when they pass through the coils of two telephone receivers. A small mirror is connected by two small wires to the diaphragms of the telephone receivers in such a manner that the arriving currents cause it to execute vertical and horizontal movements which by means of the light from an incandescent lamp, reflected from the mirror, are reproduced upon a sensitized band of paper, tracing letters on that paper which are in a few seconds automatically developed. A speed of 40,000 words per hour is claimed for this system.

Telegraphing from Moving Trains — Induction Telegraphy.— This is a system of induction telegraphy which has been in practical operation, but is not now much utilized, chiefly because the demand for such a service does not warrant the expense of its operation, one item of which, for instance, would be the employment of a telegraph operator

on each train. (See WIRELESS TELEGRAPHY.) Three methods of telegraphing between moving trains and fixed stations have been tested. Namely; an electromagnetic induction method, in which a coil of wire is wound around a car lengthwise and a straight wire is laid along the railway track or strung on poles beside the track. In the circuit of the coil and of the straight wire, induction coils are inserted; also telephone receivers. By means of the induction coil pulsations of current are set up in either of the circuits, which pulsations are transmitted by induction through the intervening air, and are heard as sounds in the telephone receiver. The sounds are broken into dots and dashes by means of a telegraph key in the primary circuit of the induction coil, virtually as in the case of wireless telegraphy (q.v.). Another means of accomplishing this result is by static induction. In this method the metal roof of a car is connected with an induction coil, in the car. This sets up charges and discharges in the metal roof which acting by static induction set up corresponding charges in wires along the track on poles, which are connected by means of condensers with telephone relays in the fixed stations. The fixed stations are also supplied with induction coils by which pulsations set up in the line wires are inductively transmitted to the roof of the car, where they are heard as sounds in a telephone receiver; a key being used in each case to break up the train of pulsations into dots and dashes.

Wireless telegraphy has also been employed for this purpose, a short metal cylinder being used on the train as the vertical wire.

Military and Naval Telegraph.— Heliography is quite extensively employed by the army and navy of this and other countries. The distance covered between any two stations is about 25 miles. Signals are transmitted by reflections of the rays of the sun, the duration of the reflections being made to correspond to dots and dashes of the Morse or any other prearranged code. One form of heliograph consists of a mirror freely movable in a socket and supported on the upper end of a tripod. The reflections are thrown in the direction of the distant station and signals are sent by interposing the hand or a screen before the mirror. When the sun is not in a suitable position to admit of its direct reflection in a desired direction, two mirrors are employed, one facing the sun, which reflects the sun's rays upon the mirror facing the distant station.

Flag-signaling, termed wig-wagging, and flash signaling by lanterns and search lights, also by horns, whistles and sirens are employed by the various armies and navies of the world. Also Morse telegraphy and wireless telegraphy (q.v.). Torches at night take the place of the flag in signaling. In flag and torch signaling, as well as in heliography and lantern signaling, one or other of the Morse codes is used, when a dot and dash alphabet is to be availed of. The United States army and navy also employ what is known as the Myer wigwag alphabet. The Myer alphabet consists of the figures 1 and 2; or combinations of those figures; 1 signifying a motion of the flag or torch to the right; 2, a motion to the left. Thus "22" signifies two motions consecutively to the left and represents the letter A. A "space" is indicated by a "front" motion. Arbitrary characters of this general type have long been used in needle telegraph systems in which a deflection to the left is represented by the figure "1;" a deflection to the right by the figure "3." Thus A would be represented by "33" in one such alphabet, or two deflections to the right.

In wigwagging or torch signaling the flagman faces exactly toward the distant station; staff is vertical in front of centre of body, but at height of waist. When the Morse alphabet is employed, a dot is represented by a motion of flag or torch to right; the dash, a motion to the the left; the space by a "front" motion. See SEMAPHORE TELEGRAPH.

Printing Telegraphy, Stock Tickers.— Printing telegraphy relates to those telegraph systems in which telegrams are printed as received on strips or sheets of paper. Generally speaking, printing telegraph systems of the stock ticker type depend for their operation upon the synchronous rotation of a wheel or cylinder at a receiving station with a type-wheel at a receiving station. If, for example, two wheels of equal size having on their peripheries type letters of the alphabet are placed side by side and are caused to rotate, it is obvious that if they start with a similar letter at a given point, each wheel will continue to present a similar letter at the given point as long as the wheels rotate at equal speeds. It is, however, a difficult matter to obtain a continuous synchronous rotation of two or more such wheels or cylinders, especially when they are revolving at a high rate of speed, unless their movements are under control of some master wheel or transmitter. Consequently, in electrical printing telegraphy, controlling devices of this nature are employed. For instance, in the well-known "ticker" systems, the type-wheels of the tickers in the various offices are placed under control of a transmitter which maintains them in synchronism by a "step-by-step" movement, so called. In certain other printing telegraph systems, such as the Hughes, largely used in Europe, the uniform rotation of the transmitting and receiving wheels is maintained by a nearly synchronous rotation of the motors at each end of the circuit, and, in addition, by a "correcting" device applied to the type wheel. See Synchronous Multiplex Telegraph in this article.

A theoretical diagram of a simple "step-by-step" printing telegraph system is shown in Fig. 18. The transmitting apparatus consists of a long cylinder T. A metal segmental W is rigidly mounted on the same shaft as the cylinder. An electric motor is mounted by friction bearings on the same shaft. The object of using the friction bearings is to permit stopping the cylinder instantly, without stopping the motor. Cylinder T carries a set of blunt pins, p, p, projecting in a spiral row from its surface. A keyboard is placed above the cylinder, with the keys directly over the pins as indicated; one key

for each pin. When a particular key is depressed, its spur, or catch, moves into the

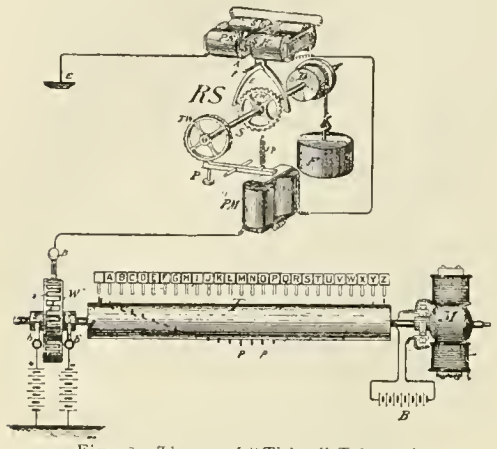


Fig. 13. Theory of "Ticker" Telegraph.

path of a corresponding pin, thereby instantly arresting the cylinder. The wheel W is insulated in two parts or segments as indicated by the zig-zag line *i*. As the wheel rotates, portions of the respective segments (*s*, *s'*) alternately pass under brush B, with the result that momentary currents pass alternately from positive and negative batteries *b*, *b'*, giving the equivalent of an alternating current on the line.

The receiving apparatus or "ticker" proper, RS, consists of a polarized relay PR (see POLAR DUPLEX); an electromagnet, termed the "press" magnet PM; a type-wheel TW, and an escape-wheel EW. A drum D by its weight F tends to rotate the shaft S on which TW and EW are mounted. The escape E is connected rigidly with an armature A of PR, and is pivoted at P. Relays PM and PR are in the same circuit, as shown. The line pulsations are of sufficient strength to oscillate rapidly the armature of the polarized relay, in consequence of which the escapement E allows the escape wheel and type-wheel to revolve rapidly. Owing to the greater inertia of the press magnet lever it does not respond to these rapid pulsations of current. When, however, the cylinder T is brought to rest, the steady current operates PM and its lever is sharply attracted and prints a letter.

Assuming that the wheel W sends out 32 electrical pulsations in one revolution these pulsations will cause one revolution of the type-wheel. Thus, if the transmitter be set in motion with brush B resting on the segment that is in line with, say, the pin under key A; while the letter A on the type-wheel is opposite the platen P on the end of the lever of the press-magnet, it follows that for every revolution, or part of a revolution of the cylinder, just enough pulsations will be transmitted to cause the type-wheel to present a letter opposite the platen corresponding to the key depressed. If the transmitter and type-wheel do not start with corresponding letters in the required position misprints follow. This is obviated by devices which bring the apparatus to a "unison" point after a few revolutions of the cylinder. The speed of rotation of this apparatus is about 120 revolutions per minute.

The apparatus shown prints letters only. When figures are to be printed, a figure wheel is placed on the shaft, side by side with the letter wheel, and a "shifting" device is employed which shifts the letter or figure wheel under the printing platen when a letter or figure is to be printed. Usually two wires are employed in the latter case, one to operate the "shift" apparatus.

In printing telegraph systems of the kind just mentioned, considerable loss of time ensues from the fact that frequently it is necessary to rotate the type-wheel the greater part of a revolution in order to print one letter. Thus, if the letter A follows B in a given word, it will require 31 pulsations of current to print A, assuming that there are 32 letters and punctuation marks on the type-wheel. If R follows C, 15 pulsations will be necessary. This conduces to a low rate of speed, perhaps an average of 30 to 40 words per minute; the message being printed on a paper strip.

Hughes' Printing Telegraph.— The operation of this system may be gathered in a general way from the immediately preceding remarks. It is not, however, a step-by-step system, but depends for its operation on the synchronous rotation of two wheels, one at each end. When a key of the keyboard is depressed at the sending station it catches a pin on a rotating wheel, or *chariot,* but does not stop the wheel. The pin so caught, however, at that instant causes the transmission of an electric current over the line. This pulsation in turn instantly operates an electromagnet at the receiving end which trips a device that throws the paper strip against the letter on a type-wheel which at that moment is in the printing position, and, assuming the transmitting and receiving apparatus to be in synchronism, a letter corresponding to the key depressed will be printed at the receiving station. The synchronous rotation of the wheels is obtained primarily by means of a pendulum at each station which is adjusted and arranged to insure a proximate rate of rotation to the respective wheels, but as the pendulums alone cannot be depended upon to maintain proper synchronism, a cam arrangement is provided which, every time a letter is printed, moves into a receptacle on the edge of the printing wheel and corrects the synchronism of the wheel, putting the wheel slightly forward or backward, as may be necessary. Pulsations of current are thus only transmitted over the line when a letter is to be printed.

Buckingham Page Printer.— To avoid the loss of time due to the rotation of a single type-wheel with many characters the Buckingham printer (in one of its forms) employs four very small octagonal type-wheels mounted side by side on one shaft. On the periphery of each wheel eight letters and other characters are placed, 32 in all. The shaft on which these type-wheels are mounted is so arranged that by an ingenious disposition of five electro-mechanically operated levers, it may be given both a lateral and a

rotary motion such that any one of the 32 characters on the type-wheels may be placed before a given point for printing, by five pulsations of current. The selection and printing of any letter or punctuation mark are brought about by a cycle of six pulsations of current in all — that is, three alternations of polarity. These pulsations are of varying length, akin in this respect to the Morse alphabet. For example, the letter A will be selected by a dash, short space, dot, short space, dot; B by a dot, long space, dash, long space, dot. Dots and dashes being made by positive currents, spaces by negative currents, as in the Wheatstone automatic telegraph (q.v.). The combinations of dots, dashes and spaces representing the different letters comprise what is known as the Buckingham alphabet. For the actual printing of a character the sixth pulse, corresponding to the space between letters and words in the Morse and Wheatstone systems, is utilized. This is always a negative pulsation. In the preparation of messages for transmission, and in the actual transmission of messages this system is almost identical with the Wheatstone automatic telegraph, and if the Wheatstone receiver were employed the messages would be recorded as dots, dashes and spaces.

The transmission of the six pulses of alternating polarity for each letter of the Buckingham alphabet operates a polarized relay in the main line at the receiving station, which relay by its armature controls two local circuits, in which are a governing relay, a unison magnet and an escapement magnet, the latter imparting, by means of an escapement, a step by step motion to a "sunflower," or distributor, of peculiar construction, to such purpose that, with the co-operation of the governing relay, and depending on the duration of the received pulses and the order of their arrival, one or more selecting relays are operated, and these, in turn, cause the operation of the type-moving levers which bring a desired letter on the type-wheel to the printing position. Hence the Buckingham printer is a positive or "step by step" system in which an escape-wheel, and with it the sunflower, is caused by a cycle of six pulses of current, one or more of which are prolonged, to undergo a cycle of six steps

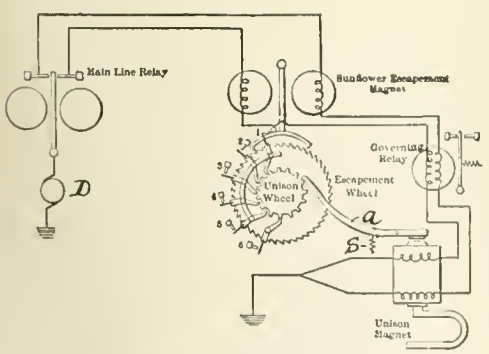


Fig. 19. Buckingham Printing Telegraph.

for each letter or character selected and printed.

Details of the receiving, unison and printing apparatus are shown in Figs. 19, 20. The main line polarized relay by its armature controls the two branch circuits in which are the instruments shown. These have two coils reversely wound, and in the case of the escapement magnet, currents from dynamo D cause its armature to oscillate from side to side concurrently with the armature of the main line relay. The unison magnet is polarized and its coils are so connected that a current from dynamo D in one of its coils (coincidentally with a negative current on the main line) tends to assist the permanent magnetism, while a current in its other coil opposes the induced permanent magnetism. The adjustment of the spring S of this magnet is such that its armature will not be attracted by prolonged positive pulses, but it will be attracted by prolonged negative pulses. Hence when short or long positive, and short negative currents are coming over the main line, the hook on the end of the armature *a* is always in the path of the teeth of the unison wheel, on the same shaft as the escape-wheel; but when a long negative pulse is received the armature is attracted, and the hook is withdrawn from the path of the teeth. The interval between any two of the teeth on the unison wheel is equal to the interval between any three of the teeth on the escape-wheel. Six pulses of current will move the escape-wheel a distance of three teeth. Hence six pulses will also move the unison wheel a distance equal to that between any two of its teeth. Thus as long as the escape-wheel is in unison with the received pulses the hook will always be drawn out of the path of the teeth, since each letter of the said alphabet is followed by a long negative pulse; and if at any time the apparatus should get out of unison it is seen that in the foregoing way five short pulses will hold it at the unison or zero point.

The teeth of the unison wheel (or sunflower) perform another important office. Around the wheel, pivoted as shown, there are six circuit-closing levers, of which five are on one metal support; the sixth is insulated therefrom. These levers are so arranged relative to the teeth that when the unison wheel moves a distance equal to the space between two of its teeth these levers are caused to close their respective circuits at 1, 2, 3, 4, 5, 6, in quick succession, beginning at 1; a long pulse causing a circuit-closer to dwell longer on its contact than a short pulse. The retractile spring of the governing relay is adjusted so that its armature will not respond to short pulses of current, but will respond to prolonged pulses of either polarity. This feature is used in connection with the circuit-closers of the distributor, or sunflower, and selecting relays, Fig. 20. These relays also have two coils reversely wound. The circuit from one of the coils of each relay is connected to the correspondingly numbered contact post on the sunflower, but this circuit is only fully completed when the armature of the governing relay is attracted. Whenever in the course of the arriving six pulses, representing a character, one or more of the pulses are prolonged,

there will also be a prolonged current in the local circuit of the governing relay, which will then attract its armature. Assume it is the first pulse. At this moment circuit-closing lever 1 is on a tooth of the unison wheel and its circuit is closed (Fig. 20) at

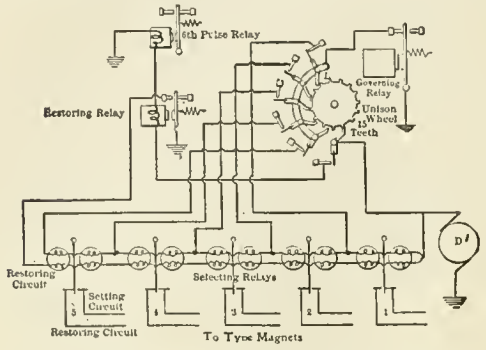


Fig. 20. Buckingham Printing Telegraph.

contact point 1. Hence, the armature of the governing relay being attracted at this instant, the circuit of No. 1 selecting relay is completed and being actuated by current from dynamo D', throws its armature to the right, operating a type-magnet 1 (not shown). This type-magnet by its armature levers will move the type-wheel into a position for printing the letter A, and if there be no other prolonged pulses that letter will be printed by the sixth pulse which operates the printing mechanism (not shown). Had the third and fifth pulse also been prolonged the third and fifth selecting relays would have been operated, and other type-magnets would have been actuated that would have brought the letter K to the point for printing. The sixth circuit-closing lever (Fig. 20) is the last to act. This lever when closed actuates two relays, one of which, termed the sixth pulse relay, operates the press-magnet, the paper feed magnet, an ink ribbon magnet and a dogging magnet; the other relay is the restoring or resetting relay which closes a restoring circuit through the selecting relays and type-wheel magnets, and thus reverts these instruments to normal position after the selection and printing of a letter.

To avoid the operation of moving a paper carriage back and forth in the manner of the ordinary typewriter, the telegraph blanks in this system are arranged in the form of a tube, which is placed loosely over a fixed tubular support. By suitable mechanism the paper tube is rotated step-by-step as each letter is printed, until at the end of a line, when it is advanced along the tubular support a distance of one line.

The main line of this system is duplexed and a speed of about 100 words per minute is obtained in each direction on a circuit between New York and Chicago, with repeaters at Buffalo. The messages are prepared for transmission by means of a keyboard perforater at a speed of 50 to 60 words per minute, one depression of a key perforating all the holes of a letter. (See Author's '*American Telegraphy*' for details.)

The Barclay Page Printer.— This system is a modification of the Buckingham page printer just briefly described. The operation of the Barclay printer up to the selecting relays, Fig. 20, is virtually similar to that of the Buckingham. At this point, in the Barclay arrangement the selecting relays, instead of operating the type-wheel shaft, are caused to select a given one of 30 or 32 electromagnets, each of which controls or operates a certain type of a typewriter which prints the letter; the message being printed by the typewriter in the ordinary way, by the aid of electrical devices. Messages may be transmitted by this system by means of a keyboard manipulated by an operator, or by means of perforated paper. This system is being introduced on lines of the Western Union Telegraph Company. For details, see U. S. Patent No. 785,076.

Murray Page Printer.— This printer is being used on the lines of the British Postoffice. The messages to be transmitted are prepared somewhat as in the case of the method utilized in the Wheatstone automatic system. The perforated paper sends certain combinations of electrical pulsations for any given letter, over a main line and these pulsations in turn operate apparatus at the receiving station which perforates a paper strip in a manner corresponding to the letters transmitted. This paper is then caused to pass before a set of metal strips which in their operation, and depending on the combination of perforations in the paper, select a certain letter of a typewriter, the message being thereby printed in page form. This system depends on synchronous movements of the transmitting and receiving apparatus, which is maintained by the action of the received pulsations upon apparatus in a local circuit at the receiving station. The speed of this system is about 103 words per minute. See Trans. Am. Inst. El. Engrs., 1901.

Rowland Multiple Page Printer.— This system was invented by the late Professor Henry S. Rowland. In its latest form it is arranged to transmit eight messages at once on one wire, four in each direction, the circuit being duplexed. For the multiplex transmission a segmental cylinder, or commutator, and a rotating trailer which passes over the segments, are employed. The segments, in series of 11, are arranged around the cylinder, a given set of transmitting and receiving apparatus being connected with a given set of segments. In this system 11 pulsations of alternating polarity are utilized for the transmission of a letter, two given pulsations out of each series of pulsations being omitted for a given letter. One manually operated keyboard is allotted to each series of segments on the cylinder and the depression of a key on the keyboard causes the opening of the main line circuit, by which means two given pulsations of a series are omitted. The omission of these pulsations affect a main line relay, which in turn operates selecting magnets in a local circuit that select the letter corresponding to the letter transmitted; the message being printed in page form. The alternating currents for the operation of this system are set up by a dynamo

machine; a motor at each end of the circuit drives the trailers, and as these motors are governed by the dynomo machine currents a synchronous rotation of the trailers at each end of the line is thereby obtained. See 'ELECTRICAL REVIEW,' New York, Nov. 15, 1902.

Baudot Multiple Printer.— This system is in successful operation on many of the telegraph lines of the French government. For its multiplex feature it employs devices practically similar to those described herein relative to Synchronous Multiplex Telegraphy. A keyboard is used, and letters are transmitted by depressing a given key which sends out the necessary combination of pulsations to reproduce a given letter at the receiving end, where by suitable selecting relays the given letter is selected and printed. The rate of signaling by this system is about 120 words per minute on one circuit. See THOMAS'S 'TRAITÉ DE TELEGRAPHIQUE ELECTRIQUE'; also 'ELECTRICAL REVIEW,' New York, April 12, 1899.

Miscellaneous Telegraph Systems.— In addition to the telegraph systems referred to herein, many others have been in actual operation during the past century, either experimentally or commercially, among which may be mentioned the electrostatic systems of Lomond, Reusse, Reizen, Don Silva, Betancourt, Cavallo; Ronald's synchronous system; the electrolytic systems of Soemmering and Coxe; the chemical facsimile systems of Caselli, Bakewell, Denison, and Bonelli's chemical printer; the chemical dot and dash systems of Bain, Morse, Anderson, Delany, Dyar; the electromagnetic systems of Alexander, Gauss and Weber, Steinheil, Schweiger; the needle systems of Wheatstone and Cooke, Davy; the dial systems of Siemens, Breguet, Kramer; the printers of House, Hughes, Phelps; the Meyer multiplex; the Mercadier multiplex and the Alteneck mechanical automatic system.

Telegraph Systems in Practical Operation. —Wherever the electric telegraph is employed the Morse system is the one most generally utilized. In some countries such as the United States and Canada, Sweden, Portugal, Switzerland, Egypt, Bulgaria, New Zealand, India, Australia and South America, the Morse system is used almost exclusively. In Great Britain, Italy, Russia, France, China, Japan, the Morse and the Wheatstone automatic, which is simply a fast Morse system, are largely employed. In Austria, Belgium, Great Britain, Hungary, Sweden, Russia, France, the Hughes printer is in extensive use. In France the Baudot printer is utilized:; also in Italy, Holland and Switzerland to a limited extent. In Great Britain, about 750 Morse ink recorders; 925 Bright's Bell; 5,000 A. B. C. telegraph, 30 Delany multiplex, and 4,700 single needle apparatus are in operation. All told there are approximately 70,000 Morse sets in operation in the United States and Canada, and 45,000 in all other parts of the world. There are in Europe about 1,700 Hughes apparatus, and in Europe and elsewhere about 530 Wheatstone automatic sets in operation. Needle systems; A. B. C., and Bell apparatus are quite largely used in Europe on the railroad and commercial telegraph lines.

It may be remarked that there is a desire on the part of the telegraphing public in all countries to receive telegrams in type and in page form, and as far as practicable the various telegraph administrations are endeavoring to comply therewith. In the United States as already intimated the Morse operators in numerous instances transcribe messages by the typewriter as received, and the different companies are now experimenting with and introducing page printing instruments on their lines, namely, the Buckingham, Barclay, Rowland and Murray systems. In Great Britain the Murray page printer has been adopted by the government, and in Europe generally, where messages are received on paper strips as by the Hughes and Baudot systems, the strips are pasted on blanks in page form, for delivery.

Speed of Different Systems.— The average speed of transmission by the Morse manual telegraph may be placed at about 20 to 25 words per minute, although skillful operators attain a speed of 45 and 50 words per minute. The speed by the Wheatstone system on short lines is about 500 to 600 words per minute. By the Hughes an average of about 30 words per minute in one direction is obtained. This system may be duplexed, giving 50 words per minute on one wire. By the Baudot system, operating as a quadruplex, 120 words per minute; as a sextuplex, 180 words per minute. By the Rowland, operating as an octuplex, or eight-fold, a rate of 320 words per minute, on circuits of moderate length, is said to be attained. By the Buckingham and the Barclay systems a speed of 80 words per minute, in each direction, may be obtained on circuits from New York to Chicago, with repeaters midway. By the Murray printer, about 80 to 100 words per minute in each direction may be obtained.

Mileage of Telegraph Lines, Wires and Submarine Cables.— In the United States the total amount of pole lines is about 238,000 miles, on which about 1,270,000 miles of copper and iron wire are erected. In Canada there are about 35,000 miles of lines and 84,500 miles of wire. In both cases the various railroad companies also operate a considerable amount of telegraph line (about 250,000 miles of wire) for the movement of trains, etc. In all other parts of the world there are approximately 435,000 miles of telegraph pole line and 1,450,000 miles of wire, exclusive of about 48,000 miles of pole lines and 216,000 miles of wire controlled by railroads. The average size of the copper wire used on telegraph pole lines is No. 12 or 14 B & S. gauge; that of iron wire, No. 6 or 8. The nature and size of the poles varies in different countries. Cedar is largely used in the United States and Canada; fir in Europe. Poles 30 to 40 feet long and set 5 feet in the earth are used. Thirty to 40 poles to the mile has been common practice, but the tendency in this country is toward the use of 45, 50 and more poles per mile to obtain greater security against sleet and wind storms. Iron telegraph poles are used in some countries.

The amount of submarine cables in all parts of the world is about 200,000 miles. Of this amount about 27,500 miles are owned and controlled by governments; the remainder is owned and operated by private companies. In all there are about 1,000 submarine cables of varying length in different parts of the globe.

While, as stated, the telegraph systems of the United States and Canada are mainly operated by private companies, the governments of both of these countries have constructed and laid for their own purposes many miles of overhead lines and submarine cables. Thus the United States government has constructed its own telegraph lines and cables in Alaska and the Phillipines. The Alaskan lines extend from Seattle, Washington, to Nomé, Alaska, a distance of 3,625 miles, including 1,439 miles of land lines, 2,079 miles of submarine cable and a wireless circuit of 107 miles in length. The government handles private commercial messages on these lines at a regular fixed charge. The Canadian government owns and operates about 3,900 miles of land lines and cables. The bulletins giving the movements of fish in the waters of the Gulf of St. Lawrence and other shore lines, together with messages relating to weather, quarantine and signal service, are transmitted free of charge.

Administration of the Telegraph.— The administration of the telegraph is in the hands of the government in all parts of the world, with perhaps the exception of the United States and Canada; in which countries the ownership and operation of the telegraph are mainly in the hands of private companies. The actual management of the telegraph systems of the various countries of the world is, of course, in the hands of the proper authorities of those countries, but, excepting again the United States and Canada, the disposition of all matters that relate to the regulation of international telegraph traffic, such, for instance, as the maximum number of letters that shall constitute a word, the alphabet to be used, etc., is reposed in the hands of the International Bureau of Telegraph Administrations, Berne, Switzerland. In fact, however, even the United States and Canada incidentally come under the control of this Bureau in so far as relates to the intercommunication of telegrams with countries under the jurisdiction of the Bureau. Thus if the Bureau decides that the maximum number of letters in a word for telegraph purposes shall be 10, the countries mentioned must perforce comply with that regulation as regards telegrams that may be destined for or that may emanate from territory wholly within the jurisdiction of the International Bureau.

Within a recent period the question of governmental supervision of wireless telegraphy in this and other countries has taken definite shape. In Great Britain by an act of Parliament the Government is given complete control of wireless telegraphy in that country and over the ships flying its flag. The other European Powers had already exercised supervision of wireless telegraphy. As a result of the report and recommendations of an inter-departmental board the United States coastwise wireless stations have been put under the jurisdiction of the navy department. This places in the hands of the navy 26 wireless stations and the equipment of 60 additional stations is under consideration. All of the coastwise stations are fully manned and will be open day and night. These stations will exchange messages with passing vessels free of charge, but such messages will be subject to the usual land telegraph tolls. Practically similar arrangements are in force between passing ships and the coastwise stations of Great Britain, France, Germany, and Italy.

WILLIAM MAVER, JR.,
Author of 'American Telegraphy and Encyclopedia of the Telegraph.'

Telegraphy, Submarine Sound, a system of communication between steamships at sea by sound telegraphy through water, an invention next in importance to wireless electric telegraphy through the atmosphere. In 1901 A. J. Mundy tested an experimental boat in Boston Harbor, based on experiments in the conductivity of sound through liquids by Prof. Elisha Gray. More recent experiments by J. B. Millet have proved remarkably successful. Signals have been exchanged between lightship bell and a ship 7 miles distant at sea.

It is a well-known fact that sound travels faster through water or liquids than air, and this is taken advantage of in a novel and practical way. In the ship at sea are two sound receivers, one upon each side in the hold, located approximately 20 feet below the surface of the water. The lightship has the sounding bell hung through a well in the centre of the ship, about 25 feet below the bottom. It also has a receiving apparatus. Near the lighthouse on shore is a buoy from which depends a bell, with a pipe leading to the shore to a compressed-air reservoir in the lighthouse. The bell is suspended by a main chain, while a second operating chain is attached at its lower end to the bell crank of the hammer, and the upper end to a pneumatic piston, which is operated by compressed air either from the anchored lightship or the lighthouse, as the case may be, or it may be operated by a direct upward pull by manual power if desired. It has been ascertained that the receiver for collecting the sound vibrations need not be located on the outside of the vessel, but operates as well when clamped on the inside against the inner surface of the outer hull, especially in iron ships. The sound vibration from the bell passing through the water is communicated to the side of the ship's hull, and that in turn to the liquid or water in the receiver. This consists of a cup-shaped metal cylinder having the open end edged with rubber, and clamped against the side of the hull. Four hook-supporting arms project inward from the hull, and upon these rest two crossbars in which are hook eyebolts, the hook portion being clamped over projections on the surface of the receiver. By this arrangement the open end of the receiver is clamped securely against the side of the ship's hull, making a water-tight joint.

Inserted in the top of the receiver is an electric transmitter, something on the order of a

telephone transmitter, from which wires are run to the pilot house of the ship. The wires are connected to a battery and the primary coil of an induction coil in the usual way, and the telephone receivers to the secondary coil. It is obvious that when a sound impulse is given to the liquid in the receiver in the hold of the ship, it will be transmitted electrically to the telephone receiver in the pilot house. As the sound travels through the water in every direction from its source, it is found that the impulse will be stronger and louder on the side of the ship nearest to the source. By this means the direction of the sounding bell is ascertained, for by listening to the telephone receiver attached to the starboard side water receiver, and then switching over to the port side and listening to that telephone receiver, the ear detects at once which is the louder sound of the two. This was determined experimentally by turning the ship around in a large circle, when the difference in the sound from one side to the other was very noticeable, according to which side was nearer or farther away from the sounding bell. In a portable apparatus of this kind for small fishing boats the bell is suspended over the side of the boat, the hammer being operated by a separate rope. In the box is a coil of electric cable attached to a hollow water-tight spherical globe containing the electrical transmitter. This is lowered overboard with the bell, and enables two boats so equipped to signal to each other. The sound is conveyed from the spherical transmitter bulb while immersed in the water to the telephone receivers in the same manner as previously described. A depth of 25 feet is said to give the best results. In foggy weather, signals of this kind are readily heard, regardless of which way the wind is blowing. It is feasible to signal words with a special code, and no doubt such a system of communication will be perfected. The usefulness of the system in safeguarding ships against collisions at sea at night or in a fog is evident.

Telegraphy, Wireless. During the past 20 years attempts have been made, with more or less success, to avail of electromagnetic induction for signaling to a distance without wires, by means of what have been termed induction telegraph systems. Such systems employ in their operation the well-known principle that when an electric current is rising or falling in one wire it will develop by induction a current in a neighboring parallel wire. Phelps and Edison have employed this principle in signaling to and from moving trains. These systems were in operation for a time on several railroads in this country, but were eventually abandoned for lack of patronage. Preece also, in Great Britain, devised and had in operation a wireless induction telegraph system. In the Preece system a wire several miles in length is strung on poles along the coast of the mainland, a parallel wire being erected on poles along the shore of an island. These wires are placed in the earth, or "grounded," at their respective terminals. By employing a battery, an induction coil and a Morse telegraph key in one of the wires, and a telephone receiver in the other, it is feasible to transmit signals by induction (possibly assisted by conduction through the water), without connecting wires, across an intervening space of two to four miles. In the operation of these induction telegraph systems from 50 to 300 electromagnetic pulsations or waves per second are utilized.

Notable as the results obtained by induction telegraph systems were considered at one time, they have been completely overshadowed by those systems in which electric waves or vibrations of an immensely higher order, namely, from several hundred thousand to many millions per second, are utilized, and to which systems the term "wireless telegraphy" is now generally applied.

The growth of present-day electric wireless telegraphy has been comparatively slow, and the discovery and development of the art can scarcely be placed to the credit of any one mind. In 1864 Clerk-Maxwell demonstrated mathematically the electromagnetic theory of light, which in effect is that electromagnetic manifestations are due to undulations of the all-pervading ether, of a nature more or less similar to the undulations of the ether which produce the manifestations of light, and that, in so far as they differ, it is mainly a difference as to the number of vibrations per second, the undulations that produce the sensation of light occurring, for instance, at the rate of from four hundred million of millions per second, to seven hundred million of millions per second; while, as just intimated, the electric undulations may not exceed a few hundred thousand or a few millions per second.

After the announcement of the electromagnetic theory of light, which involved the existence of electric waves in free space, many scientists endeavored to demonstrate experimentally the truth of the theory. The honor of this achievement fell to Prof. H. Hertz in 1887. It had been shown by Sir William Thompson (now Lord Kelvin) in 1853 that when a Leyden jar or other highly insulated condenser is discharged, the previous charge is not dissipated in one rush, but gradually, in a series of oscillations, analogously as a pendulum when pushed from its zero position will gradually come to rest after a number of oscillations. If the friction of the air and internal friction could be eliminated, the pendulum would vibrate continuously. On the other hand, if the pendulum were placed in a viscous medium and raised to its maximum position it would slowly descend to zero, and rest there, its previously acquired potential energy being used up in overcoming the resistance of the viscous substance.

It is well known that in an electric circuit containing coils of wire the current is perceptibly retarded in rising and falling, which fact is due to a property termed self-induction, or inductance, which all conductors possess to a greater or less degree. On the contrary, when a wire possesses electro-static capacity the current is assisted in rising and accelerated in falling. The property of inductance is usually likened to inertia, while capacity is likened to elasticity, in mechanics. Briefly, inductance is that property of a circuit upon which depends the number of self-induced magnetic lines of force that will be set up around or in the circuit when the current in the circuit is varying. Capacity is that property of a circuit upon which depends the amount of charge the conductor will acquire

with a given electromotive force. Electrical resistance may be regarded as molecular friction which the electromotive force must overcome in forcing the current through the conductor. The shortest electric wave thus far produced is about .15 inch in length. This is still much longer than the longest light-wave, and 60 or 70 times longer than the longest dark heat-wave yet measured. In the electric circuits employed in wireless telegraphy the resistance is small (if the spark-gap and filings coherer be eliminated). In fact, if the resistance be too great the discharge will not be oscillatory. The time of an oscillation period is expressed by the formula $T = 2\pi\sqrt{KL}$; where T is the time in seconds, π is ratio of circumference to diameter (3.1416), K is capacity in farads, and L the inductance in henrys.

In proceeding with his experiments, Hertz reasoned that, analogously as light-waves affect the eye when they fall upon it, so should electric waves in the ether affect a suitable "eye" or detector when they fall upon it. The apparatus employed by Hertz to show the existence of electric waves in the ether of free space consisted of an electric oscillator for setting up electric waves in the ether, and an electric resonator or "eye" to detect the waves. The circuit in which electric oscillations are set up may be considered to emit electric waves in the ether, virtually as a lighted lamp emits or radiates luminiferous waves in the ether. The Hertz oscillator and detector are shown in Fig. 1. The generator of the oscillations consists of

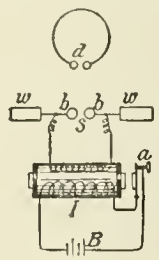


Fig. 1.
Oscillator and Detector.

an induction coil *I*, the terminals of its secondary wire being connected to small metal balls *b, b*, to which short metal cylinders, or wings, *w w* are attached. The balls are separated by a small air space, or spark-gap *s*, across which sparks jump when the coil is in operation. The vibrations of the interrupter *a* set up pulsations of current, due to battery *B*, in the primary circuit of the induction coil, which pulsations, by magnetic induction, cause alternations of greatly enhanced electromotive force in the secondary circuit. When the electric pressure rises to a point sufficient to break down the resistance of the air space between the balls *b, b*, oscillations surge back and forth in the oscillating circuit *w, b, s, b, w*, the rate of which oscillations will vary with the electrical dimensions of the circuit, namely, inductance, capacity, and resistance. The rate at which the interrupter of an induction coil vibrates may vary from 50 or less to hundreds of vibrations per second. The oscillations of the electric oscillator may be many millions per second. It is evident, therefore that the induction coil, or other alternating current generator, merely serves to strike the blow, so to speak, that sets up the rapid electric oscillations in the oscillating circuit, analogously as when we wish to keep a tuning-fork in vibration we must strike it at intervals. As a detector, Hertz employed a copper wire, *D*, of circular shape, but broken at one point. On the ends of this wire he placed small metal knobs, *d*, the distance between which could be regulated by a micrometer screw. This wire was supported on an insulating stand in a darkened room, and small sparks could be seen passing between the knobs *d* when oscillations were established in the oscillating circuit *w, b, s, b, w*. This experiment was held to demonstrate the existence of electric waves in the ether, as predicted by Maxwell.

The distance at which electric waves are detected by the Hertz devices is very limited, perhaps not more than 10 or 12 feet at most. These devices, however, demonstrated the possibility of signaling to a distance by electric waves, and the experiments set other minds at work in this direction. Not long after the announcement of Hertz's experiments, Dr. Branly discovered that metal filings, when thrown together loosely and made part of an electric circuit, have normally a high resistance, but under the influence of electric oscillations they lose this resistance and become good conductors of an electric current. It is assumed in explanation of this effect that the electromotive forces that accompany the electric oscillations in the circuit cause the filings, by electrostatic attraction, to cohere, thereby making a better electrical contact with one another, thus reducing the resistance of the circuit; hence the application of the term "coherer" to this type of electric wave detector. It was also found that when the filings had cohered they retained their electrical conductivity until they were jarred, or otherwise mechanically disturbed.

In 1894 Dr. O. Lodge (now Sir O. Lodge), in a lecture before the Royal Society, London, showed that the Branly filings coherer could be used to transmit signals telegraphically by placing them in a glass tube and making them part of an electric circuit in which was a battery and a telegraph receiver. In this experiment when the induction coil was operated at a distance of some yards from the coherer the latter was actuated. In order that the filings should not remain cohered after the oscillations had ceased, he caused the hammer of a bell operated by clock-work to strike or tap the glass tube as long as the electric oscillations continued. An electric bell has generally been employed in the later use of the filings coherer. In 1895–6 Popoff and others utilized the filings coherer as a means of detecting atmospheric electricity, employing for this purpose a vertical wire extending many feet into the air, the coherer being placed between the lower end of the vertical wire and the earth.

Theories of Electric Wave Propagation.—It is well known that substances opaque to light obstruct the passage of the luminiferous ether waves. Analogously, it was thought, in the early days of electric wireless telegraphy, that the curvature of the earth or sea between points several hundred miles apart would prove a bar-

rier to electric waves traveling, like light-waves, in straight lines, inasmuch as it would not be practicable to obtain masts, or other means of support for vertical wires, of sufficient height to overlook the barrier. Later experiments, however, showed that with wires only two hundred feet high signals could be transmitted to points between which there was a wall of earth or water 15 or 20 miles in height, due to the curvature of the earth. A number of theories have been advanced in explanation of this fact. For example, that the waves are propagated around the earth by diffraction, or reflection, but these theories are not generally held to be tenable. A theory that meets with most acceptance at present is that the electric waves are propagated as sliding waves over the surface of the earth or sea.

Before referring further to this theory brief allusion may be made to the supposed action that takes place in and around the Hertz oscillator in the production of free electric waves in the ether. The Hertz oscillator corresponds to a condenser with widely separated plates. In the act of electrically charging the arms or rods of the oscillator, lines of force or strain spring out all around the rods in the dielectric, that is, the air surrounding the rods. To fix ideas, these lines of force may be likened to highly elastic half hoops, partially flattened out, and with their ends resting on the rods. One end of the lines of force is assumed to be positive, the other negative. These hoops or lines resist straightening out and their resistance to the strain increases the further they are straightened out, until their back pressure equals the charging force. According to Maxwell's theory of displacement currents in dielectrics, during the process of applying this strain a displacement current flows in the circuit, and when the counter pressure of the lines equals that of the charging force the displacement current ceases to flow. At this time the rods of the oscillating circuit have acquired the potential of the charging electromotive force. When the external electromotive force reaches a point where it breaks down the resistance of the air gap, the energy stored in the dielectric is returned to the circuit and a current flows across the gap and the strain in the dielectric is thereby relieved, concurrently (Poynting) with which the ends of the lines of strain contract, one end sliding down the rod, the other gliding up the rod, toward the air gap. The extreme outside portion of the lines also tend to contract, but as such portions of the lines move more slowly than the ends, the latter meet, and as they cannot pass one another, the lines are snapped or whipped off, perhaps like rings of smoke from the smoke-stack of a locomotive, forming closed electric lines of force which are radiated into space. Coincidentally also with, and as a result of, the collapse of the electric lines of force, magnetic lines of force are set up concentric with the Hertz rods and at right angles to the electric lines of force. When the magnetic lines of force reach their maximum the electric lines of strain will have vanished. Immediately, however, the magnetic lines of force now begin to collapse and are detached, their collapse setting up new electric lines of strain. These processes are repeated until the oscillations cease, to be renewed when the rods are again charged and the spark gap again breaks down. The detached lines of force thus jointly constitute electric radiation, or free electric waves which are propagated as ever-expanding electromagnetic waves in free space. Any portion of these waves on reaching a receiving vertical wire excite therein the electric oscillations which affect the coherer or other detector.

Theory shows that the grounded vertical wire may be considered to be equal to one half of a Hertz oscillator (Fig. 1). The other half being the ground itself. On this assumption the earth is a perfect conductor — therefore a reflector of high frequency electric waves — and the vertical wire may be supposed to have a reflected counterpart below it, virtually like the image seen under a pencil standing vertically on the surface of a mirror lying horizontally on a table. This is in accordance with what is termed the image theory, advanced by Delaricci and Blondel. The electric oscillations in such a system may then correspond to those in the Hertz oscillator, a complete oscillation consisting in a wave from the spark-gap to the top of the antenna back to the spark-gap, thence to the foot of the reflected or imaginary wire, and back to the spark-gap, which constitutes a wave length four times that of the vertical wire proper. The wave length, $\lambda = \frac{V}{N}$, where V is velocity (186,000 miles per second) and N is number of waves per second. As the period of an oscillation or wave is $T = 2\pi\sqrt{KL}$, it is clear that the wave length of the vertical wire or other conducting circuit may be increased by adding to it capacity or inductance.

On the sliding wave theory the grounded vertical wire is assumed to be the equivalent of a Hertz dumb-bell oscillator divided in the middle by a reflecting conducting surface, the earth. Hence such a wire will have a real oscillating system above the earth and an imaginary one below the conducting surface. The oscillations occurring in this system may then correspond to those in the Hertz oscillator. Thus it is assumed that when the vertical wire is charged, electric lines of force are set up in the dielectric, one end of which lines rests on the ground, the other on the vertical wire. When the discharge occurs the upper ends of the lines glide down the wire to the earth and are pushed away by succeeding lines of force, the detached waves traveling out radially in the shape of large concentric circles, not into space, but sliding over the surface of the ground, traveling over or around the convex surface of the earth, sea and hills, or following the contour of valleys. According to Taylor, who has elaborated this theory, the intensity of the waves should not vary much less than inversely as the distance. According to Blondel and Fessenden the intensity diminishes inversely as the square of the distance. For a more extended treatment of this and other subjects relating to wireless telegraphy, the reader may be referred to the author's works, 'American Telegraphy and Encyclopædia of the Telegraph,' and 'Maver's Wireless Telegraphy, Theory and Practice.'

Marconi's Early Experiments and Work.— The Lodge experiments in 1894 were followed by those of G. Marconi of Italy in 1895. In

these experiments Marconi employed an induction coil, a Morse telegraph key, batteries and vertical wire, for the transmission of signals, and for the reception of signals, a filings coherer, a telegraph relay, batteries and vertical wire. The general arrangement of Marconi's simplest apparatus is outlined in Figs. 2 and 3. In Fig. 2, *I* is the induction coil, *a* is its interrupter, *p* is the primary wire, *s* is the secondary wire of induction coil, *B* is a storage battery of about 5 cells. *K* is the Morse key; *b b'* are the spark balls. The vertical wire *A* at its lower end is connected to ball *b;* the other ball *b'* is connected with a wire leading to the earth. Balls *b b'* of the oscillator are thus in series with the vertical wire. The terminals *w w'* of the secondary wire are also connected respectively to *b* and *b'*. The receiving apparatus is outlined

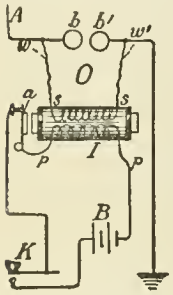


FIG. 2.

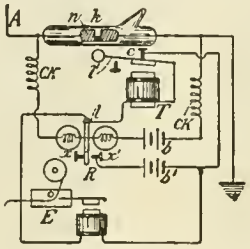


FIG. 3.

Marconi Earlier Apparatus

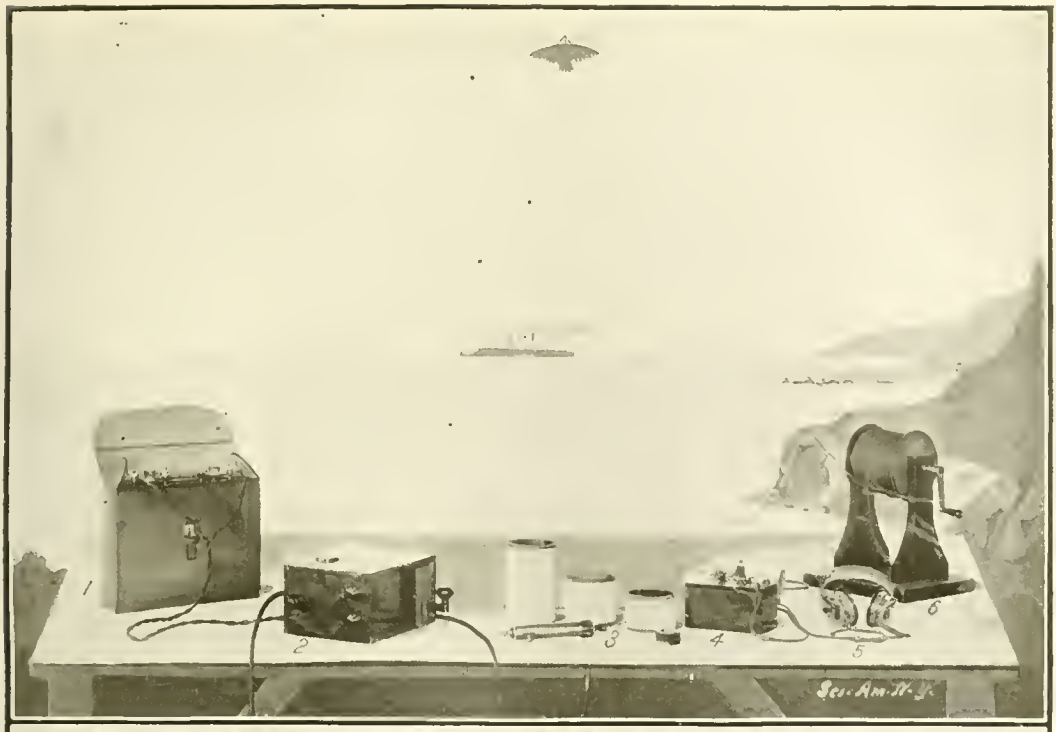
in Fig. 3. The Marconi filings coherer as it appears in practice is shown at *k*. It consists of a glass tube, suitably upheld, about 1.57 inches long and .1 inch inside diameter. The filings, a mixture of 90 per cent nickel and 10 per cent silver filings, are inserted in a small space between two plugs *n*, which fit snugly into the tube which is exhausted of air. Small wires extend from these plugs to the outside of the tube. One of these wires is connected with the vertical wire *A*, the other with a wire leading to the earth. Hence the coherer is in series with the vertical wire. The relay *R* is in a shunt circuit with a single cell of battery *b* and the coherer, as shown. The armature lever *l* of this relay controls the local circuits of the electric bell *T* and an ink recording register *E*, which are operated by local battery *b'* of 4 or 6 cells.

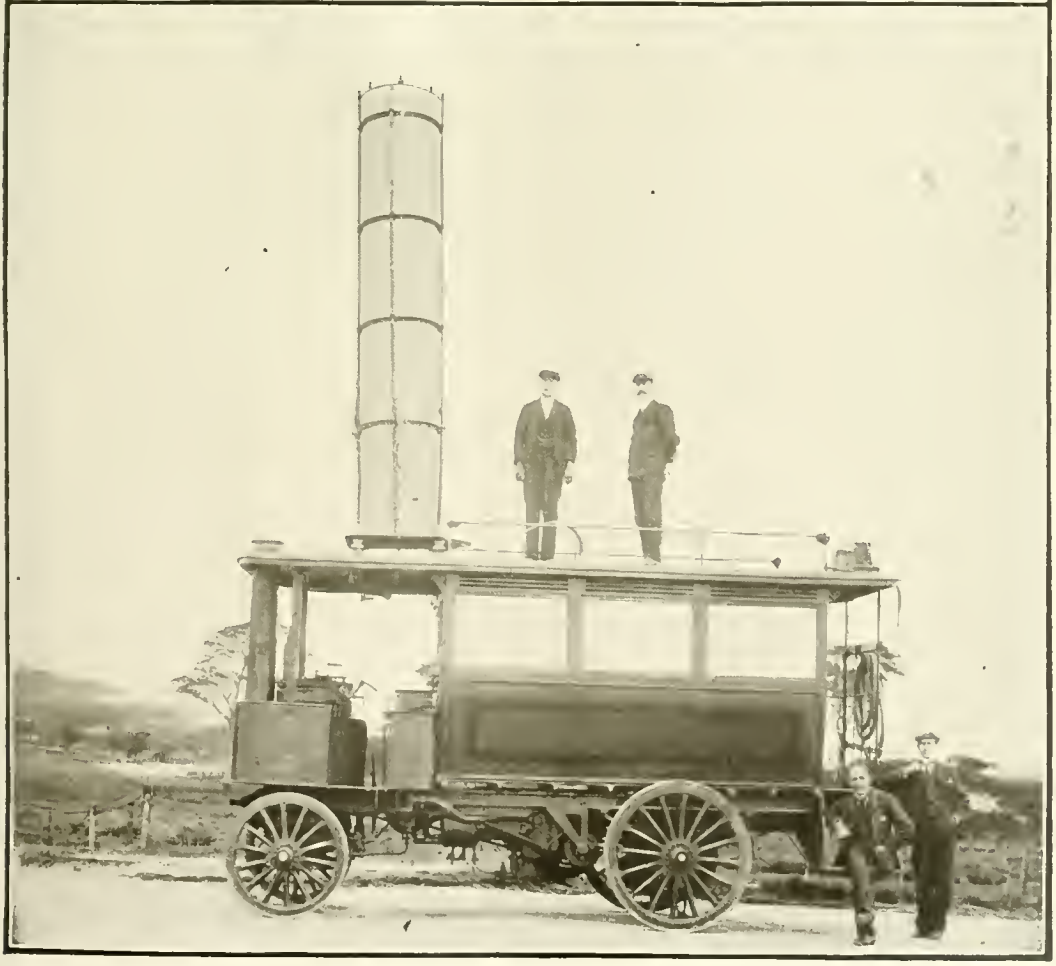
The actual transmission of messages is effected by means of key *K*, Fig. 2. Each time the key is closed the vibrator *a* starts into operation with the result that electric oscillations are set up in the vertical wire and a train of electric waves is radiated therefrom in the ether. Thus by opening and closing the key for a shorter or longer time the train of waves is broken up into signals corresponding to dots and dashes which are received as such at the receiving station. The operation at the receiving station is practically as follows: Normally the armature lever *l'* of the tapper *T* is given a tension which holds it against the contact *c*. Normally, also, the armature lever *l* of relay *R* is on its back stop *x*. Hence at this time the local circuit of battery *b'* is open. When then the electric waves set up by the oscillator arrive and electric oscillations are thereby excited in the vertical wire at the receiving station, the resistance of the coherer drops sufficiently to allow the battery *b* to energize the relay *R* and its lever *l* moves over to contact *x'*, closing thereby the circuit of battery *b'*, whereupon the electromagnet of tapper *T* attracts its armature *l'*, which act opens its own circuit at contact point *c*. At once the armature of *T* flies back on its contact point, at the same time striking the tube, decohering the filings and demagnetizing relay *R*, whose armature lever returns to its back stop *x*. Immediately, however, the filings again cohere (assuming that the oscillations continue), with the result that *R* is again magnetized, the actions just described being repeated many times in a second. Hence, while the oscillations are being received the tapper keeps up a buzz or hum, which stops when the oscillations cease. Likewise, while the oscillations continue in the receiving vertical wire the inking register *E* is actuated and dots and dashes are imprinted on the paper strip. The paper strip is started and stopped automatically, by devices well known in telegraphy, when signals commence and when they cease. (See the author's 'American Telegraphy and Encyclopædia of the Telegraph,' p. 373.)

Coherers, Auto-Coherers, Detectors.—With an induction coil using about 150 watts, obtained from a storage battery of about 10 volts and 15 amperes, and with vertical wires about 100 feet high, which are the ordinary conditions under which wireless telegraphy is operated on shipboard, lighthouses, etc., the filings coherer gives fairly good results for distances up to, say, 40 or 50 miles. The rate of signaling by the filings coherer is comparatively low, about 10 or 12 words per minute. This is due mainly to the inherent sluggishness of the coherer, the cohering and "tapping back," as well as the mechanical inertia of the moving parts of the tapper, the relay, etc., all tending to retard the speed of signaling. The large Morse keys employed in some wireless systems also preclude a very high speed of transmission. It is likewise found in practice that the filings coherer is not continuously reliable, requiring frequent and expert adjustment. Nevertheless this is the instrument that in various forms has been found best suited to general commercial requirements. The fact that its variations of resistance are sufficient to operate a sensitive relay, which, in turn, is caused to operate an ink recorder, is advantageous, chiefly for the reason that a record of the message is thereby obtained. Further, when a Morse register is used the services of a skilled telegraph operator are not essential, the ability to read the Morse alphabet from a strip being acquired in a few weeks, whereas to learn to read by sound requires many months of hard practice.

It was early evident to those most concerned in the practical operation of wireless telegraphy that a detector which would "open" on the occurrence of electric oscillations and "close" without tapping when the oscillations ceased was desirable. Such devices were not long in forthcoming. They are termed variously auto-coherers, auto-detectors, and self-righting detectors. Some are also termed anti-coherers from the fact that they increase their resistance under the influence of electric oscillations.

One of the first auto-coherers used in wireless





SLABY-d'ARCO PORTABLE WIRELESS TELEGRAPH SYSTEM.

[1] Storage Battery. [2] Portable Induction Coil. [3] Inductance Coils. [4] Microphone Receiver. [5] Pony Telephone Receiver. [6] Reels for Kites. Blue-Hill Box Kite. German Bird Kite.

MARCONI'S WIRELESS TELEGRAPH AUTOMOBILE FOR MILITARY PURPOSES.

telegraphy is due to Castelli; auto-coherers have also been devised by Marconi, DeForest, Fessenden and others, and will be described elsewhere herein. The Castelli auto-coherer is outlined in Fig. 4. It consists of a glass tube *K*, 1.7 inches in length, a carbon rod *c*, a plug of iron *i* within the tube, and a small drop of mercury *m*, placed between *c* and *i*. The rod *c* and plug *i* are adustable within the tube by the screws *h*, *h*. *A* is the vertical wire which is made a part of the coherer circuit. A telephone receiver *t* and a small battery *b* are placed in a shunt circuit around the coherer.

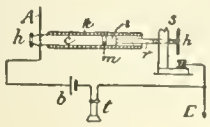


FIG. 4.
Castelli Auto-coherer.

Normally, the imperfect contact between the mercury and the carbon causes a high resistance in the coherer, but when electric oscillations occur in the circuit the mercury and the carbon cohere and the resistance falls. The consequent variations of current in the shunt circuit produce sounds in the telephone receiver of long and short duration corresponding to the dashes and dots transmitted. This auto-coherer is used extensively in the Italian navy and was used by Marconi in some of his trans-Atlantic experiments.

An auto-detector devised by Marconi is based upon the fact that electric oscillations hasten magnetic changes in iron, or, in other words, reduce the hysteresis (that property of iron and steel which retards changes of magnetism). To avail of this observed fact Marconi provides an endless iron rope or core of thin wires about 12 inches long, which revolves on pulleys operated by clock-work. The core is caused to pass through a spool on which are wound two coils of fine wire. The inner coil of wire is connected in series with the vertical wire, the outer coil is made part of a circuit in which is included a telephone receiver, but no battery. In proximity to these coils are placed two horse-shoe magnets having their similar poles adjacent. The changes of magnetization in the iron core as it passes through the coils in proximity to the horse-shoe magnets are not sufficiently rapid to set up currents in the coils, but when electric oscillations pass in the inner coil, rapid momentary changes in the magnetization of the core take place and the consequent rapid variation of the magnetic lines of force of the core set up momentary currents in the coil which are heard as sounds in the telephone receiver. With this detector a speed of 25 to 30 words per minute has been obtained in practice.

The Vertical Wire.—Marconi's first experiments in wireless telegraphy were made with a vertical wire twenty feet high at the sending and receiving stations. With this height of wire he transmitted signals one mile. With wires forty feet high signals were transmitted four miles and with wires eighty feet high sixteen miles. By improvements in the detector and increased power of the generator of oscillations signals are now transmitted 40 and 60 miles with two or three wires eighty feet in length.

A number of different arrangements of the vertical wires are now employed. For instance, in a number of wireless installations twenty wires about No. 16 gauge are suspended from a long strip of wood, which is upheld by insulators supported by a rope between the tops of two masts about 150 or 200 feet high. The wires, two feet apart, drop vertically to a similar wooden strip, where the wires are joined together and led into the instrument room. In other cases the wires are suspended from towers by well insulated arms, and are kept apart by wooden spreaders until near the ground, when the wires are connected together and thence are carried into the operating room. In other cases a single mast is employed, from the top of which a number of wires are suspended. Each wire is attached, at a distance of about 50 feet from the top of the mast, to a guy-rope, which is itself attached to an anchor post in the earth, forty feet or more from the base of the mast. The guy-rope thus first draws the wires away obliquely from the mast, then at its point of connection with the guy-rope each wire is drawn toward the foot of the mast, where all the wires converge and are thence led into the operating room; the wires forming a $>$, with the mast as a base, and no spreaders are required.

Kites and captive balloons for supporting the vertical wires have frequently been availed of for temporary use and for military operations. The material of the vertical wire does not appear to affect the results. Iron, copper and aluminum wires have been used. Wire netting has also been employed. The insulation of the vertical wires from the mast is however very important. Good earth connection for the vertical wire has been found very essential in practice, especially at the transmitting end. Copper plates thirty feet long and four feet wide, embedded two or three feet in damp earth, giving about 2,400 feet of plate surface, are sometimes used for this purpose. When feasible the ground plate is sunk in the sea. On shipboard the "earth" is secured by attaching a wire to bolts on the iron frame of the vessel. Fessenden employs a wave-chute or artificial ground at the foot of the antennæ. This chute consists of a number of iron wires which extend along the ground for 100 feet or more, in the direction of transmission, when the wires are separately grounded by contact with metal rods stuck in the earth.

The main object in employing a number of vertical wires has been to obtain increased capacity wherein to store electrical energy to be radiated as electric waves, the vertical wires being one plate of a condenser, the earth the other plate, and the air the insulating medium. The effective capacity of closely adjacent parallel wires is not however proportional to the number of such wires, but is equal, roughly, to the square root of the number of wires. The capacity of a vertical wire .1 inch in diameter and 100 feet in length is .0002 micro-farad (Fleming).

Condensers.—The condensers used in transmitting circuits for installations up to one or two kilowatts, are generally of the Leyden

jar type. Such jars 16 inches high, by 5.25 inches in diameter, have a capacity of .004 micro-farad. For more powerful installations, large plate glass condensers immersed in oil have been used by Marconi, DeForest, Fessenden and others.

Generators of Electric Oscillations.—The need of greater radiating power in long distance wireless transmission than is obtainable from the ordinary induction coil, as well as the unreliability of the interrupters of such coils, when used with large currents, which soon wear off the contact points, has led to the adoption of special forms of induction coils and transformers. Instead of battery power also, alternating current generators are employed as the source of electromotive force for these induction coils and transformers. The power of the generators may vary from 1 kilowatt to 20 or more kilowatts. The rate of alternations of the transformer depends on the frequency of the generator. The electromotive force in the primary circuit of the transformer may be from 50 to 200 volts, which is greatly increased at the secondary terminals of the transformer; in some cases to 20,000 or 50,000 volts.

Syntony or Tuning.—An important defect of wireless telegraphy in the simple form thus far described consists in the fact that but one message can be sent at one time, for the reason that if it is attempted to send two messages at once in the same vicinity, the signals will clash. Many inventors have striven to overcome this defect, amongst others Lodge, Marconi, and Slaby. The plan followed by these workers has been that of employing a syntonic or tuning method; that is, a method by which the transmitting and receiving circuits are adjusted or attuned to a fundamental rate of electric oscillations, and will respond only to corresponding oscillations. This is done by taking advantage of the fact that the rate of oscillations, or the frequency of an electric circuit is proportional, as already noted, to the inductance, capacity and resistance of the circuit. Circuits so attuned are termed selective circuits, since by sending out a given rate of waves any desired circuit within a certain radius may be selected as the receiving station.

Tuning also possesses the advantage that the benefits of resonance may be obtained by its use, as follows: It is known that a vertical wire grounded directly at its lower end is an excellent radiator of electric waves, but as it possesses very little capacity its oscillations are quickly damped, as indicated in Fig. 5, and it

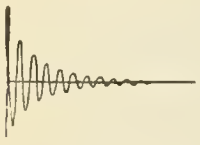


Fig. 5.
Quickly damped Radiator.

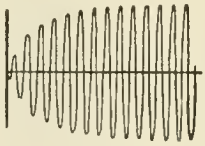


Fig. 6.
Persistent Radiator.

is only the first few oscillations that are of sufficient strength to affect a receiver. When capacity and inductance are added to a circuit in proper proportions it may be made a persistent vibrator (Fig. 6) and consequently a given amount of electrical energy expended at the transmitter in producing a succession of waves of more uniform amplitude will have a cumulative or resonant effect upon a receiving circuit of equal capacity and inductance, and will eventually cause it to respond to the waves emitted by the transmitter; while an untuned receiving circuit containing a detector, equally as sensitive as the first one, would probably not respond to those particular oscillations. According to Marconi, in one instance a transmitter which would operate a tuned receiver 30 miles distant would not affect a non-tuned receiver 160 feet away. In the case of tuned circuits, this is doubtless because the faintest oscillations, or electromotive forces, excited in the receiving circuit are resonantly amplified by the incoming waves until they affect the coherer, or detector. In tuned circuits it is therefore essential that the makes and breaks of the primary circuit of the transmitter should follow each other rapidly in order that the full effects of resonance may be obtained. Obviously tuned circuits may be very valuable in increasing the distance to which signals may be transmitted, with a given amount of electrical energy, regardless of the part tuning may play in preventing the clashing of signals.

As a rule, the spark-gap and the receiving apparatus of untuned circuits are connected directly to earth as indicated in Fig. 7, in which A is the antenna; b b are the spark balls; s is the spark-gap; S is the secondary and P is the primary of an induction coil. In such an oscillating circuit (A, b, b), the oscillations are quickly damped. In the case of tuned circuits,

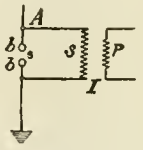


Fig. 7.
Open Circuit.

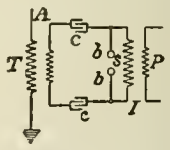
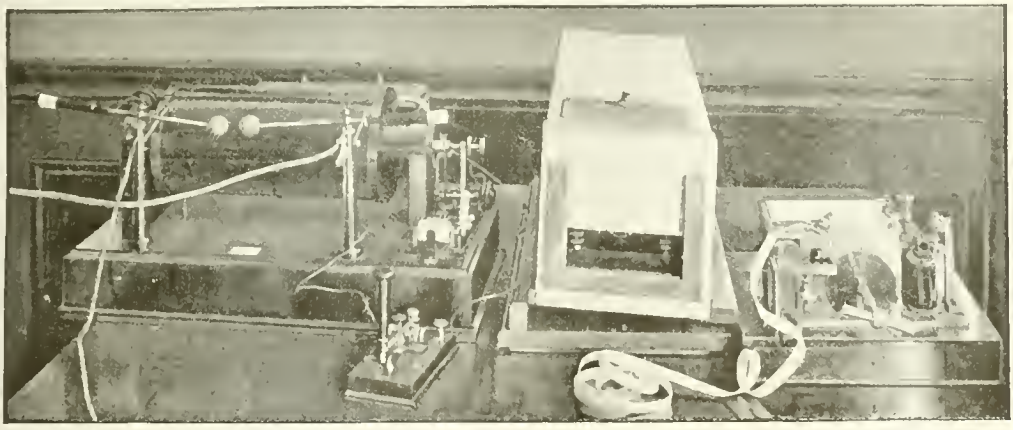


Fig. 8.
Closed Circuit.

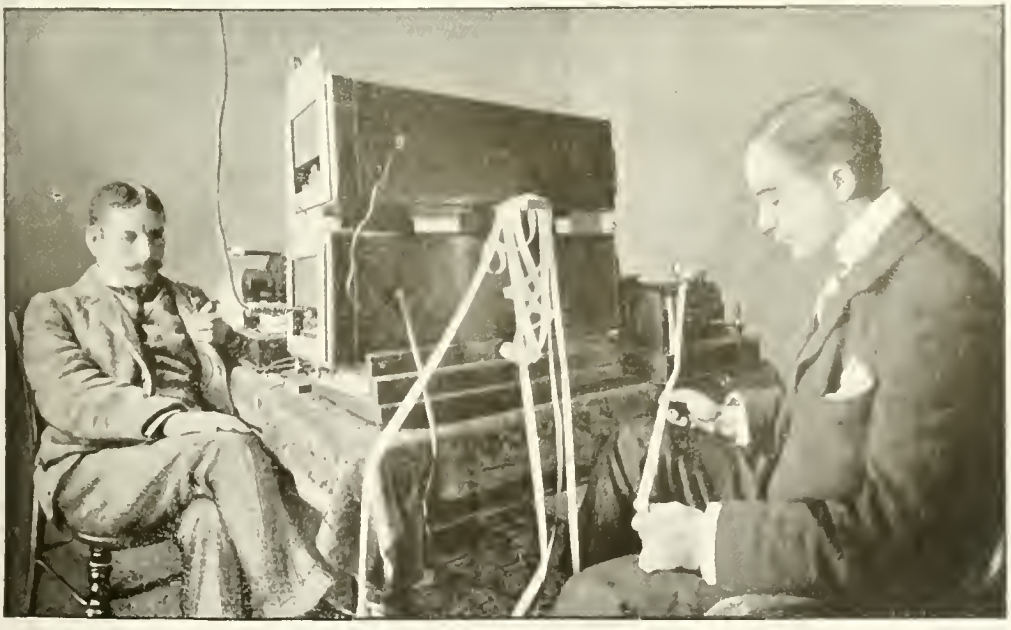
or where, at least, the effects of resonance are desired, there is provided a closed oscillating circuit which is separated from the vertical wire by a transformer. Such an arrangement is outlined in Fig. 8. The closed circuit in this case consists of the spark-gap, condensers c c, and the primary of transformer T. In practice the condensers and the inductance coils are made adjustable, so that the capacity and the inductance may be varied at will. Generally speaking, the inductance and capacity of the oscillating circuit are so chosen as to give a wave length equal to four times the length of the vertical wire; best results being obtained when the oscillating circuit and the vertical wire have equal fundamental oscillation periods; or when the one is a multiple of the other. (See remarks on propagation of electric waves herein.)

Marconi Tuned Wireless Telegraph System.—One arrangement of Marconi's tuned or syntonic transmitting and receiving circuits is shown theoretically in Figs. 9, 10. Fig. 9 represents the transmitting apparatus and circuits. In this A is the vertical wire in which is inserted an inductance coil w, the number of turns of which, in use, may be varied by a sliding contact x. By this means the period of the vertical wire may be adjusted to correspond

Experimental Station at South Foreland, showing the high pole, which is an essential feature of the Marconi system.



Transmitter. Receiver.



Apparatus in operation—message being received and read.

From photographs by Newton & Co. London.]

with that of the closed oscillating circuit *p*, *c*, *b*, *k*. The condenser *c*, usually Leyden jars, of about .25 micro-farad capacity, may also be adjustable. *I* is an induction coil. *K* is a Morse key and *B* is a storage battery of 5 or 6 cells. The receiving apparatus and circuits are illustrated in Fig. 10. As in Fig. 9 *A* is the vertical wire, attached at its lower end to an inductance coil *w*. The coils *p* and *s s* constitute what is termed a "jigger," or hoister; it is in fact a type of "step up" transformer and is used to increase the efficiency of the apparatus by enhancing the electromotive forces acting upon the coherer; availing of the fact that there is a "node" of electromotive force and a "loop" of current at the foot of the vertical wire,—that is, at that point the electrostatic energy is at minimum while electromagnetic energy is at maximum. (See remarks on Slaby-Arco system relative to electric pressure at top of vertical wire.) *K* is the Marconi filings coherer, which is in series with the secondary coil *s s* of the jigger. A small condenser *c* is connected as shown, this forming a short path for the oscil-

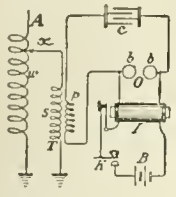


Fig. 9.

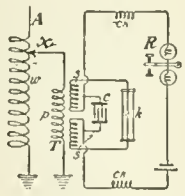


Fig. 10.

Marconi Tuned System.

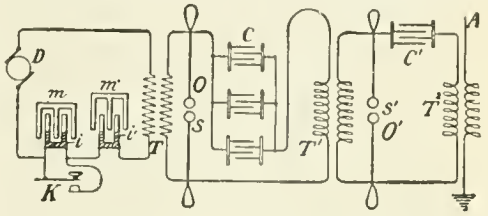


Fig. 11.

Fleming's Transmitting Circuits.

latory currents via the coherer, inasmuch as for momentary currents the condenser is practically a conductor. *ck ck* are small choke coils (really inductance coils), which direct the oscillatory currents across condenser *c*, thereby preventing any diversion of these currents through the relay *R*. This is a polarized relay of from 1,200 to 10,000 ohms resistance, in the circuit of which is a single cell *b*. The relay is usually inclosed in a cylindrical case to exclude dust. Some of the relays used for this work will respond to a current of $\frac{1}{200000}$ of an ampere. In practice this relay, the jigger, the coherer and tapper are inclosed in a metal sheathed box to prevent the action of external electric waves upon the coherer. For the same reason the local contacts of the relay and tapper are shunted with resistances, not shown in the figure. The Morse key employed is massive, with front and back contacts which are insulated from one another. It is provided with a large vertical ebonite handle to protect the operator against shocks.

Marconi Cylinder Arrangement.—Marconi has devised an arrangement, which is used in connection with tuned circuits, in which the vertical wire is replaced by two large concentric metal cylinders. The outer cylinder is about 4 feet high and 1.3 feet in diameter. The cylinders as thus arranged constitute in effect two plates of a Leyden jar, or condenser, giving a large capacity, thereby providing a persistent vibrator. The outer cylinder is connected with the apparatus, the inner cylinder is connected to ground. This device is suitable for use on motors or railroad cars. By means of this arrangement signals have been transmitted a distance of 31 miles.

The Fleming Long Distance Transmitting Circuit.—In Fig. 11 is shown diagrammatically an arrangement, designed by Professor J. A. Fleming for the Marconi Wireless Telegraph Company, to be used in long distance transmission. In the figure *D* is a 500 or 1,000 volt alternating current generator of 10 or 20 kilowatts capacity, and having a frequency of about 50 per second. *T*, *T'* and *T''* are transformers. The primary circuit of *T* is in series with the generator *D*, and the coils *i*, *i'*. The transformer *T* raises the electromotive force to about 20,000 volts, charging the condensers *C*, which discharge across spark-gap *S*, setting up oscillations of a high order in the oscillating circuit *O*, *S*, *C*, *T'*. These oscillations are again transformed to higher voltage in the secondary of *T'*, which in turn charges condenser *C'*, and this, in discharging in the oscillating circuit *O'*, *S'*, *C'*, *T''*, still further increases the electromotive force thrown upon the vertical wire or wires *A*. The estimated electromotive force obtained at the vertical wire in this way is about 100,000 volts. These condensers and transformers are of special construction to withstand these high pressures and to give the desired capacity and inductance. To avoid directly opening and closing the primary circuit of the transformer *T*, the two choke coils *i*, *i'*, having movable iron cores *m* *m'*, are placed in that circuit. The iron core *m'* of *i'* is so adjusted that as much current as may safely be passed through the primary of *T* shall normally flow in the circuit. The core *m* of *i* is inserted to its full length in the coil, and its inductance is sufficient to stop all flow of alternating current in the circuit. This coil may, however, be short-circuited by the key *K*, at which times the current attains its full value. Hence the circuit is not opened in the usual sense, but to avoid sparking at its contact points key *K* is opened in oil.

The Lodge-Muirhead Wireless Telegraph System.—The transmitting and receiving circuits of this system are shown theoretically in Fig. 12. Closed oscillating circuits are employed. For short distances an induction coil with an external vibrating interrupter is utilized. For long distances an alternating current generator is employed. One of the important features of this system is the coherer *K*, which is a modification of the Castelli mercury coherer, previously described. It is termed an oil film coherer and consists of a rotating steel disk *d*, the lower edge of which enters a vessel *V*, containing a drop of mer-

cury, but the disk is prevented from making contact with the mercury by a film of mineral oil. Electric oscillations in the circuit of the coherer cause the mercury and the disk to cohere, but decoherence takes place the moment

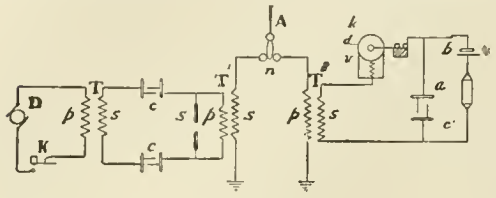


FIG. 12.
Lodge-Muirhead Transmitting and Receiving Circuits.

the oscillations cease. In the figure, *D* is the generator. *K* is a manually operated Morse key. *T* is a step up transformer which raises the voltage to some desired value at the terminals of the secondary wire *s*. *S* is the spark-gap consisting of upper and lower metal rods carried on an ebonite frame. *s, c c, p* is the oscillating circuit, in which are excited the high tension oscillations that are thrown on the vertical wire *A*, via the secondary *s* of transformer *T*. The vertical wire may be connected with the sending or receiving circuits as desired by means of the switch *n*. The receiving circuits and apparatus are shown at the right of the figure. T^2 is a transformer the secondary of which, with the coherer *k*, and condenser *c'*, comprise the receiving oscillating circuit. The variations of resistance in the coherer cause fluctuations of the current, due to the small battery *b*, with the result that the siphon recorder *a* is actuated, and records dots and dashes on a paper strip. As the currents in this local circuit that affect the recorder are all in one direction the recorder is brought to zero by a spring, the dots and dashes being therefore made on one side of the paper, not on alternate sides, as in the case of the siphon recorder used in submarine cable signaling. The Lodge-Muirhead system is in operation in various parts of Great Britain.

Slaby-Arco Wireless Telegraph System.—There are several variations of this system in operation. For signaling over comparatively short distances, a 6-inch induction coil is sometimes used. For distances from 25 miles up to 50 miles a more powerful induction coil with a mercury turbine interrupter has been utilized, but this has been supplanted by a device termed the Grisson interrupter, which consists of a rotating commutator (motor driven) that by peculiar connections of the inductor converts a direct primary current into an alternating current, giving, it is claimed, a pure sine wave. For still greater distances an alternating current generator of three or more kilowatts is employed.

The principle involved in the operation of the Slaby-Arco transmitting and receiving circuits, shown theoretically in Figs. 13, 14, is that when very rapid oscillations of electricity are set up in a wire, one end of which is free and the other end is to earth, the maximum amplitude of oscillation or potential will be at the top or free end of the wire, and at the foot of the wire there will be a node. This is assuming that the wire is one-quarter the length of the transmitted wave. The manner in which this theory is utilized is indicated in the figure. *A* is the vertical wire. A spool of wire *w* is placed in series in the vertical wire to add inductance to that wire, and by properly selecting this spool the wave length may be increased as desired. It would not be practicable to place the coherer at the top of the vertical wire to obtain the benefit of the maximum amplitude of potential at that point. But Dr. Slaby has found that when a horizontal wire is connected to the base of the vertical wire, a maximum of potential exists at the free end of that wire. He therefore places the coherer *k* in the wire w^1 at that end as shown. In the figures, *i i* are adjustable inductance coils, and *c c* are adjustable condensers, used in tuning the respective circuits. The coherer *k* consists

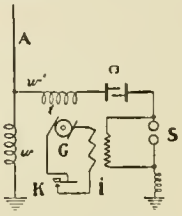


FIG. 13.

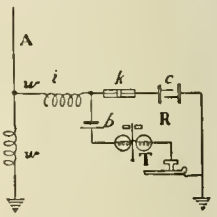
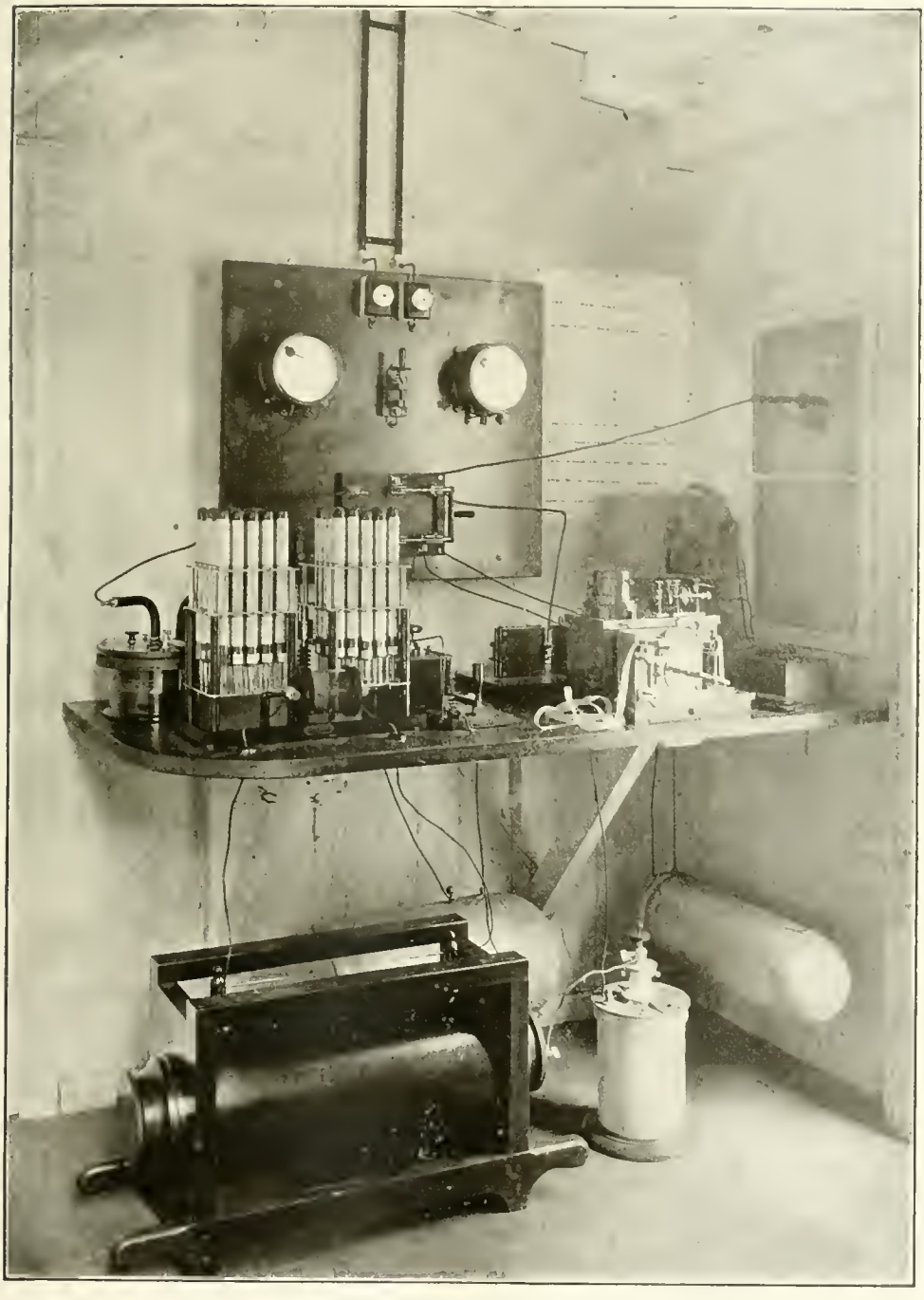


FIG. 14.
Slaby-Arco Transmitting and Receiving Circuits.

of silver or platinum filings contained in a tube, which is exhausted of air to prevent oxidizing and to keep the filings dry and easily movable. In Fig. 13 *G* is the source of electromotive force for an induction coil *I*. *S* is the spark-gap which in practice is enclosed in a micanite case to deaden the noise, which in the case of powerful sparks is of a loud nature. In Fig. 14 *R* is a sensitive polarized relay. *T* is the tapper, the hammer of which in practice is placed in proximity to the coherer for the usual purpose.

The Braun-Siemens-Halske Wireless Telegraph System.—This system possesses several important features. First, the fact that the ground connection to the vertical wire is displaced by capacity areas consisting of large metal cylinders. Second, closed transmitting and receiving circuits. The theory of the transmitting and receiving circuits of this system is indicated in Figs. 15, 16. *C, C* are the capacity areas. *T* is an induction coil, or "inductor," of peculiar construction, the primary of which has four turns of heavy wire; the secondary wire has forty turns of somewhat smaller wire, wound outside of the primary. This inductor is immersed in oil in a suitable containing vessel. It is designed to have low inductance and a small time constant. The primary *p* supplies inductance to the oscillating closed circuit *p, c, c, S*, this circuit being tuned by varying the capacity of Leyden jars *c c*. *S* is the usual spark-gap. *I* is an induction coil provided with a Wehnelt electrolytic interrupter *W*. Key *K* is a telegraph key of heavy construction, capable of breaking currents of 50 amperes in the primary circuit of the induction coil. To prevent excessive sparking and to hasten the interruptions at the contact points of the key a magnetic blow-out is employed. In Fig. 16 it may be seen the conditions at the vertical wire



The Braun Wireless Telegraph Station at Heligoland.

are virtually reversed as compared with the arrangement in the transmitting circuit; the vertical wire *A* and condensers *c*, *c*, and primary wire of a small transformer *T'*, forming an oscillating circuit; the feeble received oscillations

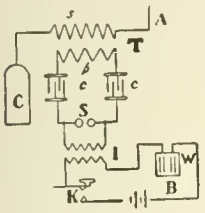


FIG. 15.

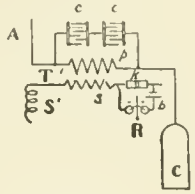


FIG. 16.

Braun Transmitting and Receiving Circuits.

being thereby transformed to higher potentials in the secondary oscillatory circuit *s*, in which is the coherer *k*. One terminal of the coil *s* is connected to the coherer, the other terminal is connected to a loose coiled wire *s'*. The vertical wire circuits and the oscillatory circuits are, in this system, also tuned to a corresponding rate of oscillations. *R* is a sensitive polarized relay, controlled by the detector *k*. The Braun detector is a filings coherer, the filings of which are of hardened steel contained in an ebonite tube. The tube is not exhausted of air, Prof. Braun not having found this to be necessary. It having been found that some magnetism is beneficial in the metal plugs between which the filings are placed in the tube, a magnetic ring is employed to give them any desired degree of magnetization. A clock-work operated tapper is used to decohere the filings.

This system and the Slaby-Arco system have recently been brought under one management and it is understood the best features of each system will be employed as may be found advantageous in practice.

The Branly-Popp Wireless Telegraph System.—This system employs the usual transmitting and receiving devices, including an induction coil, oscillatory circuit, vertical wires, etc. The detector employed is novel and consists of a tripod of three tapering rods, the feet of which rest on a polished steel disk. The rods are composed of tempered steel, which had first been given a high polish, after which a film of rust had been deposited on the rods by heating them to a desired temperature in a furnace. This is to take advantage of the fact discovered by M. Branly that a coherer consisting of a polished metal and an oxidized metal, in contact, possesses high sensitiveness and is very reliable. The rods are connected at the top by a metal disk. The rods and the polished steel disk are then made part of the circuit in which is included a polarized relay and a small battery. The coherer is decohered by tapping. This system is in use in numerous places in France.

The Rochefort Wireless Telegraph System.—The Rochefort system is now employed quite extensively in France and a number of the war vessels of the French navy are equipped therewith. This system corresponds somewhat in its general features to the simple form of transmitting and receiving apparatus shown in Figs. 2 and 3, except that Rochefort has introduced modifications of the induction coil and other parts of the apparatus. The induction coil employed in this system is based on Oudin's unipolar resonator; its secondary wire being so wound and connected in the circuit as to give a uni-directional current. The negative pole of this coil is connected to the terminal of the spark-gap attached to the vertical wire, while the positive pole is connected with the grounded side of the spark-gap. The source of current in the primary may be a storage battery or dynamo machine. The interrupter employed consists of an electro-mechanically operated reciprocating rod, moving in and out of mercury. The primary circuit is broken for the transmission of Morse characters by a plunger key analogous to that used by Ducretet. A filings coherer is employed when a recording instrument is used. When a telephone is to be utilized as the receiver some form of auto-detector is necessary. The Rochefort coherer consists of a glass tube, in the centre of which are two soft iron cylinders through which runs a small ebonite tube. The ends of the iron cylinders nearly touch. A copper rod is passed through the ebonite tubes which insulate the rod from the iron cylinders. Iron filings are placed in the space between the plugs. A small horse-shoe magnet is placed outside of the tube for reasons stated relative to the Braun coherer. The usual relay and tapper are used. A double throw switch transfers the vertical wire from the transmitter to the receiver and *vice versa*, as desired.

The Ducretet-Popoff System.—This system is in operation in France and Russia. It employs the usual induction coil as a means of setting up oscillations in the aerial wire. The primary circuit of the induction coil is opened and closed for the transmission of signals by a manually operated key consisting of a vertical rod, on the end of which is a flat ebonite knob. A spring normally holds the rod out of a cup of mercury which, with the vertical rod, is made part of the primary circuit. When the rod is depressed by the hand it enters the mercury, closing the circuit. When the hand is removed the spring lifts the rod out of the mercury. A rotary mercury interrupter is employed to set up the pulsations of current in the primary. The key breaks up the train of oscillations into intervals corresponding to dots and dashes. A vertical wire terminating in a metallic cone shaped cage is employed in this system. An auto-coherer of the carbon type is used, together with a small battery and telephone, as the receiver. Messages have been transmitted a distance of 60 miles by this system.

Guarini Relaying System.—M. Guarini of Belgium has made numerous experiments of different kinds relative to practical applications of wireless telegraphy. For instance, the application of wireless telegraphy to automatic fire-alarm telegraph purposes. Another, relative to signaling to and from moving trains, in which experiment a distance of about 10 miles was reached, with an iron tube, 7 or 8 feet high on the train, as a vertical wire, and using the existing telegraph wires along the tracks to convey the waves to and from the fixed station. Another experiment by Guarini related to the reception and transmission of messages simultaneously at the one station. On the theory that conductors are opaque to electric waves of the frequency

used in wireless telegraphy, he used a metallic screen to cut off the waves coming from one direction, while at the same time he transmitted signals in the opposite direction by means of a specially designed relaying instrument. The detector used by Guarini was the Blondel regenerable filings coherer. The regenerable feature of this coherer consists in a tubular extension from the tube of the coherer, in which extension a small quantity of filings are carried. It is thus easy to withdraw filings from or add them to the coherer as desired. The filings are in a vacuum.

The DeForest Wireless Telegraph System.—To avoid the recognized imperfections of the induction coil when operated with the ordinary interrupters, DeForest has from the first em-

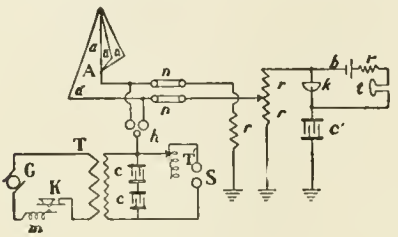


Fig. 17.
DeForest Transmitting and Receiving Circuits.

ployed alternating current generators as a prime source of electric oscillations. Hitherto also he has avoided the use of any form of filings coherer and has utilized a detector known as a "responder," in conjunction with a telephone, as the receiving instruments. This system has been employed commercially in this country and in Japanese and Chinese waters. The DeForest transmitting and receiving apparatus are outlined theoretically in Fig. 17. The transmitting system consists of the alternating current generator *G*. An impedance coil *M*. A telegraph key *K*. A transformer *T*. Spark-gap *S*. Inductance *T'* and Leyden jars, or condensers, *C*. The vertical wire is not directly attached to the transmitting circuit, but communication is made therewith across a short air space *h*. The oscillating circuit consists of the condensers *C*, spark-gap *S* and the inductance *T'*. This arrangement of the transmitting circuits is partially due to Mr. H. Shoemaker. The receiving circuits comprise the detector *k*, small condenser *c'*, tuning resistances *r*, *r*, *r*. The detector *k* is in a shunt circuit with a small battery *b*, a variable resistance *r'* and telephone receiver *t*. The vertical wires *A* in this system are usually arranged as indicated in the figure. A number of the wires *a*, *a*, *a*, are joined together, as shown, and connected to earth, for receiving, through a resistance *r*. A single wire *a'* is connected through tuning resistances with the detector *k*. These vertical wires are connected at the top. When the system is arranged for transmitting, the receiving apparatus is disconnected from the vertical wires by the knife switches *N*, *N*, and *vice versa*. In transmitting, the alternations are set up in the primary circuit of *T* by a generator *G*, giving an electromotive force of about 200 volts. This is transformed to 20,000 volts or more in the secondary. Rapid oscillations are set up in oscillating circuit and these are thrown upon the vertical wire via the air space *h*. At the receiving station the incoming oscillations affect the detector *k* with the result that sounds of long and short duration are heard in the telephone during the time that signals are being transmitted. The detector *k* now used in this system consists of a very fine wire extending into a liquid contained in a small cup. Another wire enters the cup at the bottom as indicated in the figure. The liquid is a slightly acidulated solution. Two theories are advanced as to the operation of this detector; one, held by De Forest, being that the action is electrolytic, the current from the small battery *b* normally set ting up a counter-electromotive force of polarization, which the arriving oscillations disturb. this effecting the desired result in the telephone. The other theory, due to Fessenden, will be mentioned in connection with the remarks on the Fessenden wireless system, next described.

The Fessenden Wireless Telegraph System.—The inventor of this system has made numerous improvements in the art of wireless telegraphy for which patents have been granted, and there are many variations of his system.

The transmitting and receiving circuits and apparatus of one variation, omitting a number of details, are outlined theoretically in Fig. 18. In this figure *A* represents the antennæ composed of 15 or 20 vertical wires. *S* is the spark-gap. The transmitting apparatus is shown to the right of the spark-gap; the receiving apparatus to the left thereof. *T* is a suitable induction coil or transformer. *D* is a source of alternating current. *F* is a switch in the primary circuit of *T*, used to open that circuit when the system is set for receiving. Another switch, not shown, cuts out the receiving system automatically when signals are being transmitted from the home station. Preferably, Fessenden allows a continuous succession of pulsations to pass to the vertical wire, but varies

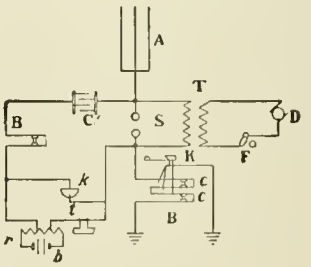


Fig. 18.
Fessenden Transmitting and Receiving Circuits.

the frequency of the oscillations by means of a tuning box or grid *B*. The receiving system being attuned to a rate of oscillations corresponding to the normal rate of the transmitting circuit will not respond to an abnormal rate emitted by the transmitter, when the inductance and capacity of that circuit, in *B*, is varied by the short circuiting prongs from the key *K*, at the time the latter is depressed in sending. The capacity and inductance of the grid *B* are adjustable by means of sliding contacts *c c*. The oscillatory receiving circuit consists of the antennæ *A*, condenser *C*, tuning grid *B'*, detector *k* and wire to ground via *B*. The detector is in shunt with telephone receiver *t*, small battery

b and adjustable resistance *r*. The detector *k* is claimed as one of Fessenden's most important patented inventions. It consists of a small insulating vessel containing a dilute solution of nitric acid, into which is inserted for a short distance (.005 inch) a very fine platinum wire (about .00004 inch diameter). Another platinum wire not necessarily so fine enters the acid from the bottom of the vessel, and the detector as a whole, termed a liquid barretter, is connected between the vertical wire and ground, for receiving, as shown in the figure. According to Fessenden's view all the resistance in the conducting medium is concentrated within a short distance of the point where the fine platinum wire enters the acid, and hence all the temperature effects are local, or take place inside of a hemisphere of exceedingly small radius. The heating effect of the small battery *b* normally increases the resistance of the shunt circuit, which resistance is broken down by the incoming electric oscillations, and the variations of current strength due thereto are recognized in the telephone receiver as dots and dashes. The action of this detector, therefore, according to Fessenden, is thermic, not electrolytic. The current from the battery *b* is initially low, the battery being composed of two cells in opposition, one of the cells being of slightly higher electromotive force than the other. The current flow is further regulated by the resistance or potentiometer *r*.

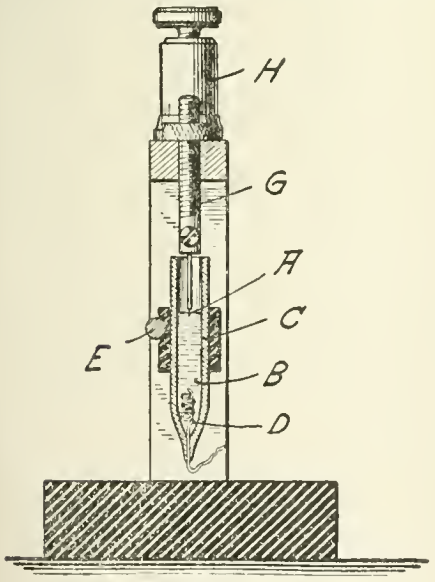


FIG. 19.

The liquid barretter is shown separately in Fig. 19. *A* is the exceedingly fine platinum wire, adjustable as to its position in the solution *B* by a screw *G*. The solution is contained in a vessel *C*, through the bottom of which enters the lower wire *D*. The vessel is held in place on a suitable support by the clamp *E*.

Present Uses of Wireless Telegraphy.—At the present time (1904) wireless telegraphy has passed the experimental and has entered the practical stage for distances ranging from 5 to 150 miles over water. There are already hundreds of wireless telegraph sets in daily operation on lightships, lighthouses and on mercantile and naval vessels. The Marconi system, for instance, is used extensively by the British navy and elsewhere. A chain of stations equipped with this system extends from Belle Isle on the Gulf of St. Lawrence to Fame Point on the River St. Lawrence, 322 miles from Quebec, keeping incoming and outgoing vessels in touch with headquarters for over two days before reaching and after leaving port. The packets plying between England and Belgium are also equipped with this system and by its means are able to apprise their owners of their whereabouts in all kinds of weather. The Slaby-Arco and Braun systems are in operation on many of the German warships and lighthouses and also on a number of the warships and in some of the forts of the United States. These systems are also in use by the war departments of different countries for overland military purposes. The Rochefort system, as already noted, is in operation on many of the warships of the French navy. The DeForest system is in operation between Port Limon, Costa Rica, and Bocas del Terro, Central America, a distance of over 90 miles, and other stations are being equipped with this system. The United States signal corps has recently installed a DeForest wireless circuit with modifications by Captain Wildman, from Saint Michael to Safety, Alaska, a distance of 107 miles.

For overland purposes not much progress has yet been made with wireless telegraphy. In recent tests signals have been transmitted between St. Louis and Chicago, a distance of over 300 miles, but it remains to be determined what part, if any, the numerous telegraph and telephone wires along this route may have played in the transmission. In any event until it becomes possible by further improvements in the art to prevent interference between different systems and stations in the same neighborhood, but little progress can be made toward overland wireless telegraphy. In fact this interference has been found to work adversely to the success of wireless telegraphy between ships, and ships and coast stations. It is hoped that by means of syntony this interference may be overcome in a large measure. Fessenden, Stone, DeForest, Marconi, Slaby and others are working to this end, and it is claimed that it is already possible to receive as many as nine different wireless messages at one station simultaneously. This, however, is not being done in public and the statement requires verification. In the meantime the great utility of wireless telegraphy as a means of communication between points where overland wires or submarine cables are not available is daily becoming more fully recognized.

Bibliography.— Turpin, 'Les Applications Pratiques des Ondes Electriques'; Righi and Dessau, 'Die Telegraphie ohne Draht'; Lodge, 'Signaling Through Space Without Wires'; Vreeland, 'Maxwell's Theory and Wireless Telegraphy'; 'Maver's Wireless Telegraphy, Theory and Practice.'

WILLIAM MAVER, JR.,
Member American Institute of Electrical Engineers; Author of 'Maver's Wireless Telegraphy, Theary and Practice,' etc.

Telemachus, tĕ-lĕm'a-kŭs, in the Homeric Trojan War cycle, a son of Ulysses and Penelope. He was still in the cradle when his father went to the Trojan war. When his father had been absent from home about 20 years, Telemachus was urged by Athēna (Minerva), who appeared to him in the guise of Mentor, a friend of Ulysses, to go and seek him; and as the place of his residence and the cause of his long absence were then unknown, he visited the courts of Nestor and Menelaus to obtain information. He afterward returned to Ithaca, where the suitors of his mother Penelope had conspired to murder him; but he escaped their treachery. His father had arrived in the island two days before him, and was then in the house of Eumæus, a faithful swineherd. Telemachus is the hero of Fenelon's famous romance 'Les Aventures de Télémaque' from which the word "Mentor" has been adopted into proverbial use.

Telemachus, a Syrian monk, who, in the time of the Emperor Honorius, about 400 A.D., leaped into the arena of the Coliseum and attempted to separate the gladiators. He lost his life at the hands of the enraged populace, but the occurrence is said to have influenced Honorius to discontinue gladiatorial combats, which he did soon afterward.

Té'lé maque, tĕ-lĕ-mȧk, Les Aventures de, a French prose epic in 24 books, by François Fenelon (q.v.) relating the adventures of Telemachus, son of Ulysses, when with Mentor he set out in search of his father. The hero represents Fenelon's conception of an ideal youth, and the romance was written as a model for the author's young pupil, the son of Louis XIV. Many of the incidents have been interpreted to show political motives and interests, but doubtless these are exaggerated. The story follows in general plan the Æneid and the Odyssey. The language is simple and classic in its purity, and 'Télémaque' has always been a favorite reading book for beginners in the study of French.

Telemeter, various instruments designed to measure the distance of objects more or less remote. It is used by surveyors and engineers, where rapid work is necessary and a fair amount of accuracy required, on the battlefield to determine ranges, etc., where it is usually called a range-finder (q.v.). The surveyor's telemeter is better known as a stadia (q.v.), and consists of a mounted telescope with horizontal cross-wires, which, when in use, intercept the divisions upon a graduated rod held by an assistant at the distant point. The reading multiplied by the "factor" of the instrument gives the distance.

Teleocephali, that is, (Gr. *τέλεος*) complete (Gr. *κεφαλ'η*) head. A name applied by some authorities to a group of fishes embracing most of the teleosts, or true bony fishes.

Teleology (Greek, *telos*, "end" or "purpose") denotes a mode of explanation in accordance with which the world as a whole, or particular forms within it, are regarded as due to the realization of some end or purpose on the part of some intelligence existing either in the world or outside it. Thus we might account for the various arrangements of the physical universe — the distribution of land and water, the movements of the heavenly bodies, the changes of the seasons — by referring them to some end that the governing power of the universe is thereby achieving, as, for example, the preservation and comfort of mankind. Or we might explain the structure of an organism or of any of its parts by reference to the purpose that it serves, as, for example, the presence of fish in the sea through their usefulness to man as food, or the structure of the eye through the actual service that it renders. It is natural to assume that everything has been made for man and to regard all things as existing for his service and convenience, that "even the cork-trees," as Hegel remarked in satirizing this view, "have been produced in order that we may have stoppers for our bottles." Teleology does not always adopt this narrowly anthropocentric point of view. But the very essence of its procedure is to postulate the existence of some intelligible ends or purposes in the world, and to read the various natural phenomena by reference to these ends. It is thus explanation in terms of final causality (q.v.) rather than in terms of efficient causes or mechanism. Teleology seeks to make things intelligible by showing their relation to an end that is being realized; it answers the question "Why?" or, "For what purpose?" Mechanism, or explanation by efficient causes, on the other hand, knows nothing of a purpose. It shows how the result has actually been produced by the operation of natural causes, acting according to invariable laws. It explains by answering the question "How?" It is well known that there has been a constant conflict, throughout the whole history of thought, between teleological and mechanical modes of explanation. Indeed, this may be said to be the supreme question at issue in all philosophy. Is the world and all that it contains merely the natural product of efficient causes acting without any intelligent guidance, or is there some purpose or system of purposes being realized?

The terms in which the conflict between teleology and mechanism are expressed have been modified in recent times, and it is perhaps well to note some fundamental differences between the thought of the present time and the earlier mode of conceiving teleology. The older teleology regarded God (or the gods) as a being outside of the world who in an external way was accomplishing some purpose through it, as the mechanician uses a machine to accomplish his purposes. From the modern point of view, God is identical with the ultimate principle of things. The purpose of the world, if any intelligible purpose exists, is not something superimposed on it from without, but an inner or immanent purpose to which it naturally and everywhere gives expression. The general acceptance of the modern doctrine of evolution, with its natural explanation of organic forms and modifications, at first appeared to overthrow teleology. For it was from the phenomena of organic life that the defenders of the older teleology had drawn their strongest proofs. Living forms and processes did not seem explicable by mechanical processes, and here, at particular points, it was supposed one could trace the operation and determining influence of the teleological factor. The Darwinian theory doubtless destroys the possibility of conceiving teleology as a particular influence that occasionally intervenes at special points in the process of the world, superseding and doing the work of effi-

cient causes. But modern thought has come to realize that the end or purpose is not something that operates here or there, at particular points, but as immanent principle is the underlying basis of the world-process as a whole. In other words, there is no conflict between teleology and mechanism — between explanation by means of final and that by means of efficient causes — when the proper sphere and limitations of each are understood, but it is rather true that as mutually complementary conceptions they presuppose each other. Modern teleology admits to the full the rights of mechanical explanation in every field. But it insists that the facts of experience and the nature of our intelligence demand that we shall everywhere go beyond this standpoint and recognize an underlying system of purposes in the world-process. The two modes of explanation are thus on different planes, and opposition between them only arises from failure to recognize this fact. As Lotze says: "The true source of the life of science is to be found in showing how absolutely universal is the extent, and at the same time how completely limited the significance of the mission which mechanism has to fulfil in the structure of the universe."

Both a mechanical and a teleological view of the world was developed by Greek philosophy, the former by the Atomists, of whom Democritus is chief, the latter mainly by Plato and Aristotle. The influence of the latter thinkers, united with the general spirit of the Christian doctrines, made the teleological the prevailing mode of explanation during the Middle Ages. The pioneers of modern thought,— Galileo, Bacon, Descartes, Gassendi, Hobbes, Spinoza — worked out anew the mechanical theory, making it a powerful instrument of research by basing it on exact mathematical principles. They were strongly opposed to teleology, which they regarded as entirely unable to furnish scientific explanations of natural occurrences. Leibnitz was perhaps the first thinker in modern times who saw that teleology and mechanism can be reconciled by properly distinguishing the planes where each principle has its valid application. For Kant (whose treatment of teleology is very important), mechanism is the only principle that we can confidently apply in science as objectively determining phenomena. Teleology, on the other hand, although a necessary subjective thought when we are dealing with organic phenomena, cannot be affirmed to have objective application. Living things must appear to us as if they were determined by some end, but we can never say that this purpose is actually present outside our minds in the objective phenomena themselves. At the same time, while mechanism is and must remain the sole principle of determination in the phenomenal world, Kant teaches that we are obliged to postulate a world of noumenal or more ultimate reality where teleology, by recognition of a moral purpose in the world, becomes the final determining principle. See also MECHANISM.

Consult: Windelband, 'History of Philosophy'; Höffding, 'History of Modern Philosophy'; Spinoza, 'Ethics' (Appendix to Part I.); Kant, 'Critique of Pure Reason' (latter part of 'Transcendental Dialectic'; 'Critique of Judgment' (Second Part); Janet, 'Final Causes' (1876); Shoup, 'Mechanism and Teleology' (1891).

J. E. CREIGHTON,
Professor of Philosophy, Cornell University.

Tel"eosau'rus, Teleosauridæ, an extinct genus and family of crocodiles found in Mesozoic deposits. See CROCODILES, FOSSIL.

Teleos'tei: Teleostomi. See ICHTHYOLOGY.

Telepathy. Telepathy is the influence or effect produced by one mind on another mind otherwise than through the recognized channels of the physical senses. It is generally conceded that the human mind has power to influence other minds in the manner indicated, but the laws which govern its phenomena are little understood. The London Society for Psychical Research, with its branches in most civilized countries, has rendered signal service in this direction by collecting evidence, and bringing a mass of individual observations together for classification and study. Suggestion undoubtedly forms the basis of telepathic communication. Some writers have maintained that the mind in the telepathic state is incapable of inductive reasoning; the mind operating at such times by reflex action from whatever is suggested to it. According to the advocates of this theory, man is endowed with a dual mental organization; the objective and the subjective mind. The objective mind usually dominates, and takes cognizance of the world through the five physical senses. The subjective mind is operative through intuition, but only dominates and becomes marked when the objective senses are held in abeyance; as is the case in sleep, or in the so-called hypnotic state. At such a time, the subjective mind accepts without hesitation any suggestion made to it; and through the principle of association of ideas adds new features to it, and clothes it with appropriate surroundings. "The suggestion may be in the form of a mental image, then the mind swiftly completes the picture." It is maintained that telepathy is the usual means of communication between two minds in the subjective state, and some go so far as to affirm that it is only between two subjective minds that telepathy can be employed, hence the efforts of hypnotists and mediums to put themselves *en rapport* with their subjects. The subjective mind of the hypnotist suggests the message to the subjective mind of the subject. It is well understood that the subjective mind of any individual is under its own control, therefore a person cannot be hypnotized against his own will. "Auto-suggestion" is the assertion of a person to his own subjective mind, which operates the same as a suggestion from an outside source. It is by employment of this method that mediums hypnotize themselves. It is recognized as extremely difficult, if not impossible, to impress a suggestion upon a mind in its subjective state, which is contrary to the settled principles, or habits of the individual's life. The stronger and more deeply rooted are these habits, the stronger are the auto-suggestions which counteract the suggestion from without, and tend to neutralize, if not to displace it. Conflicting suggestions are fatal to telepathy; hence the field of telepathy is limited and circumscribed. It is always and everywhere subordinate to the will and reason, which by their nature are fitted for the control of the whole mind. When reason fails to hold the ascendency, and the subjective mind yields itself

unreservedly to the power of suggestion, we have the various forms of insanity common among men.

The aspect of telepathy which comes within the scope of the physical sciences is the question whether there are, or are not, emanations from the brain capable of traversing space and affecting another organism similar to its own. While there are analogies among the physical forces, there is as yet no definite answer to this question.

Telephone. The word «telephone» (French, *téléphone;* German, *Telephon;* Greek, τηλεφωνη) means «a voice from afar.» It is applied exclusively to devices whereby articulate speech is transmitted and heard at points distant from one another. «The lovers' telegraph» is the simplest device for this purpose. It consists of two hollow cylinders, one end of each covered by a membrane, and connected together by means of a stretched string. The vibrations of the membrane in one cylinder are transmitted through the string to the membrane of the second cylinder, where they are reproduced. This principle has been applied in mechanical or acoustic telephones with a good degree of success for short distances. In the mechanical telephone, metal diaphragms take the place of membranes, and an iron wire the place of the string used in the lovers' telegraph. The line wire is attached to the diaphragms by means of a system of loops which distributes the strain. It is carried around corners by means of a truss which is not rigid in its construction, and hence accommodates itself to the expansion or contraction in the line. Mechanical telephones have been used for distances as great as three or four miles. At one time a large number were employed in New York, but nearly all have been replaced by the more efficient electrical instruments.

Electrical Telephones.— The electrical telephone most largely used in the United States is taken as an example of such instruments. Figure 1 represents the essential parts of the «White solid block transmitter» which

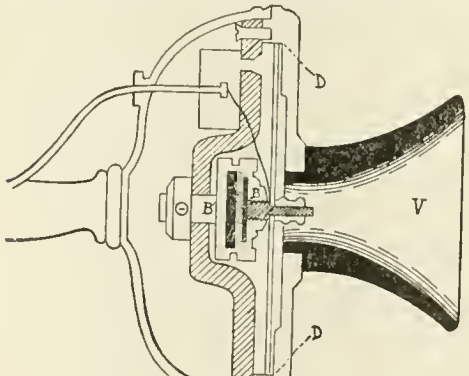


Fig. 1.

embodies the latest improvements in telephony. The speaker stands in front of the mouth-piece V and the vibrations of his voice impinge on a metal diaphragm D. Attached to this diaphragm at its centre is a button of hard carbon represented by B. Opposite to it, and fastened to the frame of the instrument, is a second button B′. The space between the two buttons is filled with coarse granulated carbon. These two buttons constitute the electrodes of the transmitter. A current of electricity from batteries or generators passes from one to the other, by means of the granulated carbon, which interposes in the path of the current an indefinite number of loose contacts. The resistance of the circuit, and consequently the strength of the current, is thus capable of being varied by the vibrations of these particles. The diaphragm and the carbon button attached to it communicate their vibrations to the granulated carbon, hence the voice of the speaker, carrying both inflection and articulation, are reproduced in varying strengths of the electrical current. Figure 2 represents the form of re-

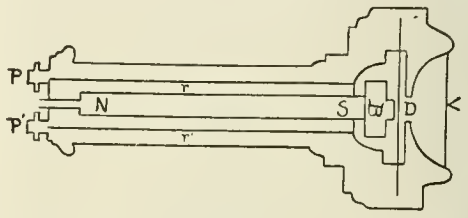


Fig. 2.

ceiving instrument generally used in the United States and known as the «Bell» telephone. It is a straight bar electro-magnet with its coil of wire (B) restricted to one pole. This coil connects with the line wire from the transmitter by means of the copper strips r, r′, and binding parts p, p′. Directly in front of the magnetic pole S is a metallic diaphragm D. The whole is enclosed in a suitable case of ebonite.

The varying strengths of the electrical current, produced by the vibrations in the transmitter, cause corresponding variations in the magnetic state of the bar magnet and its coil of wire. These are intensified, as well as reproduced by the diaphragm D; so that the ear placed at the opening of the receiver V is acted on by vibrations which are exact facsimiles of those taking place in the transmitter; hence the person listening recognizes them as the voice of the speaker, with whatever characterization is impressed on them. The «Gower» telephone used in Great Britain substitutes a semicircular magnet for one straight bar, and each pole supports a small piece of iron on which the coil is fixed. It also substitutes flexible acoustic tubes for mouth-pieces. The «Ader» telephone, used in France, Belgium and Austria, employs a circular magnet, and a soft iron ring, called an «over-exciter,» above the diaphragm. This telephone receiver is exceedingly sensitive. The «Siemens» telephone used in Germany, employs a long horseshoe magnet with two coils and steel polar pieces. The Swiss telephone is a modification of the Bell instrument, in which laminated steel magnets are used, with soft iron polar pieces. All of these instruments operate by induction on the principle of the original Bell telephone.

Theory of the Magneto Telephone.— The theory of electrical action and reaction in the magneto telephone is at the best somewhat ob-

sure. It would seem that the vibrations which are heard in the receiver are caused by molecular vibrations in the whole system, including the line wire, and that these are intensified in the coil and its magnetic core. It is certain that the coil alone will reproduce speech; that the insertion of a magnetic core intensifies the effect; and that the addition of an armature or diaphragm strengthens the latter by its magnetic reaction, as well as reproduces the vibrations themselves. The ear receives the sum total of these effects and apparently does not distinguish between them.

A number of theories have been advanced to account for the electrical action in the modern microphone transmitter. They may be enumerated as follows:

First, that the electrical resistance in the carbon varies directly with the pressure.

Second, that the surface of the carbon is surrounded with an envelope of air and other gases in a condensed form, and that variations in contact between the surfaces of the carbon vary the thickness of this envelope, and hence the resistance of the circuit.

Third, that the molecules of the carbon are surrounded by spaces comparatively larger than themselves through which the molecular forces of attraction and repulsion act. In case of a loose contact, few molecules are within the sphere of each other's attraction. A slight increase in pressure at the contact points, it is supposed, increases this number enormously.

Fourth, that arcs are formed between the carbon particles, the variations in heat lower or raise the temperatures of the carbon and its resistance. Carbon has the remarkable property of having its resistance lowered when heated — the reverse of metals.

Microphone Transmitters. — Microphone transmitters have been constructed in a great variety of form, both in this country and in Europe. "They may be classified as those in which a single loose contact is maintained; those in which a line of loose contact is maintained; those in which multiple contact is provided for; and lastly, the granular form, which combines the two preceding. The best illustration of the first class is the Blake transmitter. A single contact is maintained between the platinum point P (see Fig. 3) and a button of polished carbon (C) by means of the adjusting screw G and a strip of iron (F) known as the anvil.

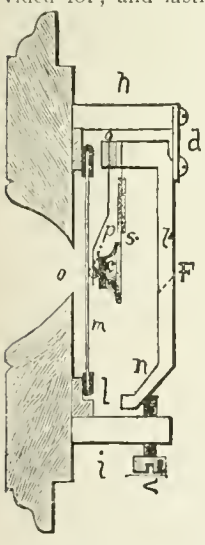


FIG. 3.

This transmitter has very clear and fine articulation — but is not powerful. It has been largely replaced by the "White solid block" form. The second class of transmitters has been used but little.

The third class has been largely employed in Europe. The "Gower Bell" transmitter may be taken as an example. In this transmitter eight carbon pencils are arranged in sets of four, so that the outer ends of each set are in loose contact with the same number of carbon blocks, and their inner ends with one central carbon block. The current, as a consequence, must pass simultaneously through 16 loose joints. These loose joints respond to the vibrations of the diaphragm, which is placed horizontally and protected by a teak board. The "Ader" and "Crossley" transmitters are constructed on this principle. The fourth class may be represented by the "Hunning" transmitter which was the forerunner of them all. It originally consisted of a front diaphragm of platinum behind which was a carbon plate at a distance of about one eighth of an inch. This intervening space was loosely filled with granulated carbon. When the diaphragm vibrated, its inner surface was brought into varying contact with the carbon particles and its vibration was communicated to all the particles in the cell. The current in passing from the platinum diaphragm to the carbon plate was thus intercepted by a multitude of loose joints in vibration, and varied accordingly. The "White Solid Block" transmitter, the "Kellogg," the "Swedish American," the "Manhattan," the "Century" and the "Ericsson" belong to this class.

Use of the "Induction Coil."— The march of improvement in microphone transmitters, it will be seen, has been in the direction of providing a larger range of variation of resistance for a given variation of the voice. This of itself would prove futile if it were not for the induction coil, which is an essential feature of every microphone transmitter. The resistance in the transmitter has to do only with a local circuit, made up of the battery and the primary wire of the coil. Compared with this local circuit, the resistance of the transmitter is large, and its variations, due to articulate speech, cause comparatively large fluctuations in the primary of the induction coil. The induced currents in the secondary of the coil, connected with the line wire and the earth, are of high electromotive force, capable of overcoming a high resistance, hence we can telephone through a long distance of wire. The earth may be used to complete the circuit. It has been found best to make the resistance of the secondary wire in the coil about equal to the resistance of the line wire outside of the coil. Translation from one circuit to another is made by running the line through the primary of a second induction coil, and so on for as many circuits as are required. The remarkable sensitiveness of the magneto telephone receiver renders such translations possible. No less than eight transformations of energy take place in a single circuit between the speaker's voice and the listener's ear. It has been estimated that the magneto receiver will respond to .0005 of a volt, and .000,000,000,000,6 of a milli-ampére.

Induction in Telephone Circuits.— The greatest obstacle which commercial telephony has had to encounter has been the inductive effect of one telephone circuit on another, or from neighboring telegraph circuits, electric light and trolley systems. These induction effects which are present wherever one closed circuit is in proximity to another, cannot be removed, but they have been largely counteracted by arranging the circuits so that the induced currents in the outgoing and incoming wires shall neutralize each other. Where wires are held in close proximity on the same poles it has been found advisable to arrange them in spirals, each wire making a complete turn for a definite number of poles. By this means any set of two wires can be kept at an average distance from the dis-

turbing influence of another wire. In the case of cables, both overhead and underground, many devices are resorted to, but the best is the use of a separate return wire for each circuit and the circuits arranged spirally, or so that their planes do not run parallel to each other.

In the United States, the American Bell Telephone Company has 50 per cent of its wires, exclusive of its long distance lines, under ground. It is not possible at present to telephone great distances underground. Overhead long distance lines extend from Portland, Maine, to Omaha, Neb., 1,800 miles, and have required 565 tons of hard drawn copper wire for their construction.

Telephone Exchanges.— An essential feature of every telephone system is an "exchange" or central office where the wires of subscribers are brought, and means afforded for putting any two subscribers in communication with each other. The apparatus which does this is technically known as a switchboard. Switchboards vary in construction in different countries. The "multiple switchboard" of the Western Electric Company has been largely adopted in the United States and England. The underlying principle of a switchboard is to bring each line wire to a perforated metal strip which normally grounds the wire, and also through an "annunciator" which in response to a signal from the subscriber causes a shutter to drop on which the subscriber's number is indicated. The operator then inserts a "jack" between the two wires required for the message, and by so doing cuts off the ground connection at the central office. The modern switchboard is the result of 25 years of experience and is a marvel of complexity in design and construction. Its cost varies from $500 to $1,000 per square foot, according to the number of wires accommodated. The life of a modern switchboard is comparatively short.

Historical.— In 1819 Sir Charles Wheatstone invented an instrument which was popularly known as the "magic lyre," but which he called "the telephone." This is historically the first use of the word. Wheatstone's device consisted of a number of solid rods connecting musical instruments with sounding boards. These sounding boards were placed at a distance from the instruments themselves, and reproduced the music successfully. This apparatus was exhibited before the Polytechnic Institute in London in 1831. During the next decade, the discoveries of Faraday and Henry in electromagnetism, and the inventions of Morse in telegraphy, gave a new impetus to researches in electrical science. By 1837 C. G. Page of Salem, Mass., had observed the sounds which an electro-magnet makes when the current which flows through its coil is rapidly "made and broken." He had also discovered that these sounds, when sufficiently rapid, produce a musical note. His discoveries were followed by the investigations of MM. Wertheim, De la Rive, Beatson, Wartman, Marrian, Matteucci, Guilleman and others.

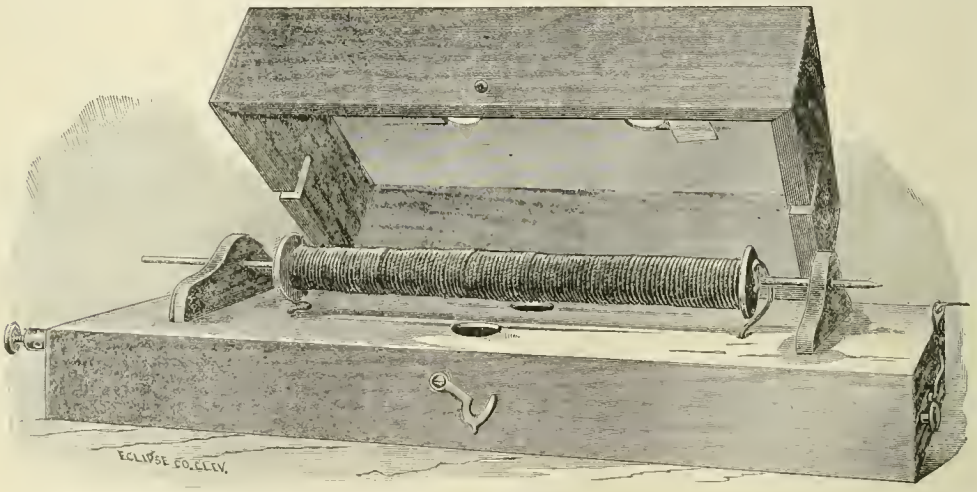
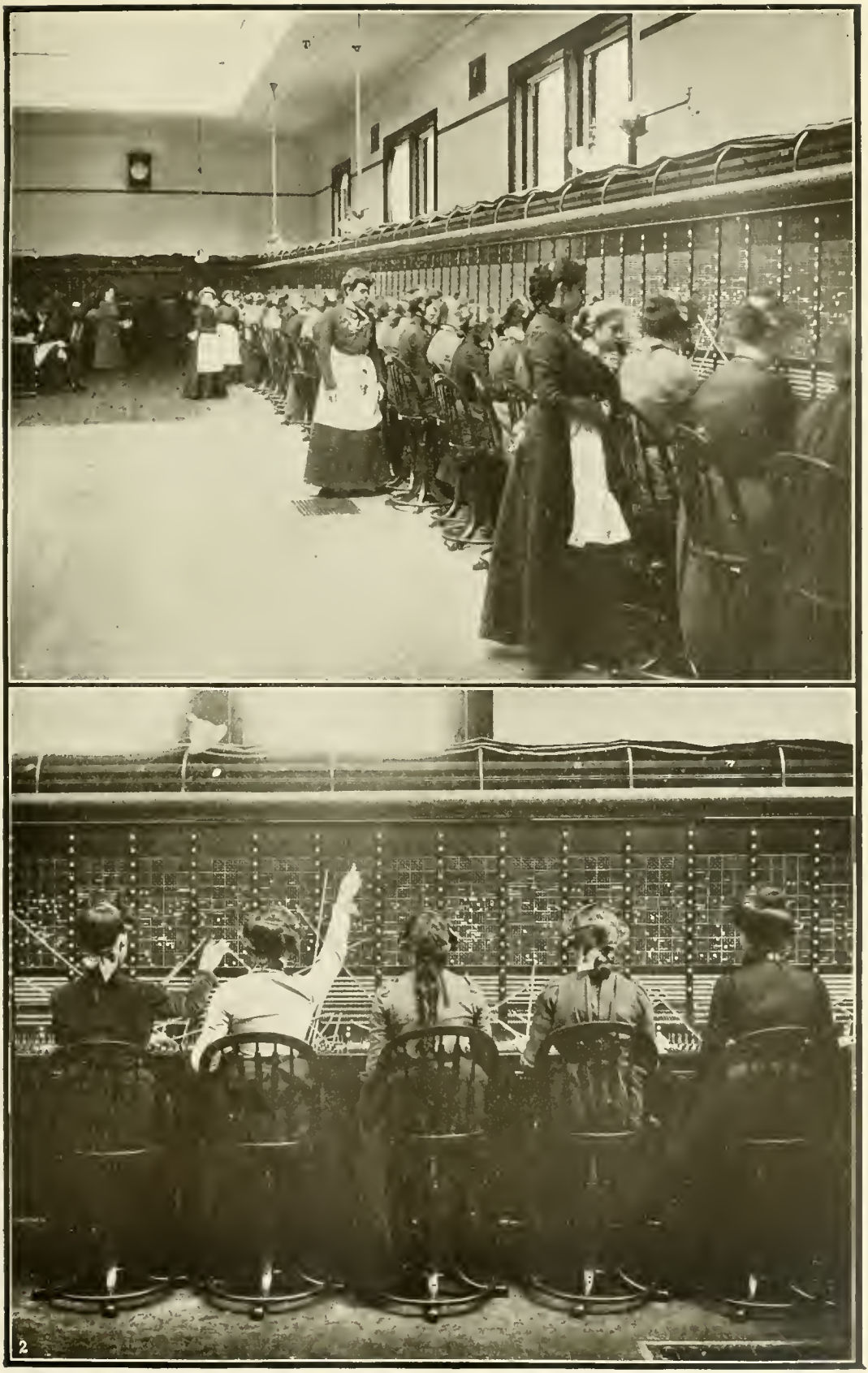


Fig. 4.— An Original Reis Receiver. The magnet is composed of a bobbin inclosing a knitting needle, whose ends extend beyond the bobbin, and are received in bridges on the resonant case. The terminals of the bobbin are connected with the electrodes of the transmitter, a battery being placed in the circuit. Sounds uttered in the mouthpiece of the transmitter cause the membrane of the transmitter to vibrate, and so produce changes in the current at the contact of the electrodes. The fluctuations of the current affect the magnet of the receiver, so that sounds are produced in the receiver like those uttered in the transmitter.

In 1854 M. Charles Bourseul published a paper in which he advanced the theory that *speech itself* might be transmitted by electricity. "*Suppose*," said he, "*that a man speaks near a movable disk, sufficiently flexible to lose none of the vibrations of the voice; that this disk alternately makes and breaks the current from a battery. You may have at a distance another disk which will simultaneously execute the same vibrations.*" In 1860 Johann Philipp Reis, a teacher at Friedrichsdorf, exhibited an apparatus as the result of his studies since 1851, which theoretically embodied the suggestion of Bourseul and the discoveries of Page; but which in its essential construction, and mode of operation, closely approached the telephones of to-day. A reproduction of the drawings of his apparatus taken from the original instruments is shown in Figs. 4 and 5.

Reis continued his work on the telephone



1. General View of the Multiple Switchboard of a Telephone Exchange. 2. A portion of the "A" Board, showing Multiple-Jacks, Outgoing Trunk-Jacks, Answering-Jacks and Plugs.

until 1864. He invented a number of improved devices and lectured before the Physical Society of Frankfurt-a.-M. on the subject. He also published a memoir on "telephony by means of the galvanic current." Unfortunately, his invention was regarded during his lifetime as little more than a scientific curiosity, and the practical use of the telephone was postponed for years.

Researches of Alexander Graham Bell.— About the year 1874 Alexander Graham Bell, of

FIG. 5.— An Original Reis Transmitter. The body of the transmitter consists of a block of wood pierced by a conical hole, over the smaller end of which is stretched a membrane. A strip of platinum connected to the middle of the membrane forms one electrode, and a thin strip of metal extending to the middle of the membrane and provided with a platinum point, which rests on the platinum strip, forms the other electrode. The conical cavity forms the mouthpiece.

Boston, Mass., who was engaged in investigations on multiple telegraphy, undertook at the suggestions of the Boston Board of Education a series of experiments to demonstrate optically the vibrations of sound for use in teaching the deaf and dumb. The results of these experiments convinced Mr. Bell that articulate speech could be transmitted and received electrically by means of a modification of the apparatus he had devised for multiple telegraphy. Figure 6 shows the apparatus devised for multiple telegraphy. Figure 7 the same apparatus with its modification for articulate speech.

In Figure 6, E and E′ are two electro-magnets connected by the line wire W and battery B. A and A′ are two steel reeds, each clamped at one end to the uncovered poles of the magnets. The other ends of these reeds project above the coils, and in close proximity to these cores. When the reed A is vibrated by any mechanical means, corresponding changes in electrical equilibrium, termed undulations by

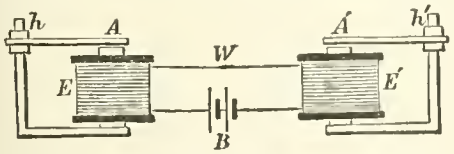


FIG. 6.

Mr. Bell, traverse the coils and throw into vibration the reed A′ at the other end of the circuit. In Figure 7, E and E′ are the same two electro-magnets and A and A′ the steel reeds, but the reeds in this case are connected to membranes which are stretched across conical mouth-pieces C and C′. The steel reeds A and A′ are intended to vibrate in unison with the membranes and the voice. This apparatus, owing to mechanical difficulties, did not at first prove successful, and was abandoned for the improved form shown in Figure 8. The latter was exhibited at the Centennial Exhibition, Philadelphia, 1876. From this to the modern Bell telephone is but a step. The electro-magnet is now confined to a straight bar, and the coil restricted to one pole. At first, this instrument was used both as a transmitter and a receiver, but its efficiency as a transmitter was limited to comparatively short distances. As a receiver it has been permanently retained. It is operative with a current of electricity, or with permanent magnets alone, or with both.

Contemporary with the investigations of Alexander Graham Bell were those of Elisha Gray of Chicago. Gray's researches in multiple harmonic telegraphy led him also to the conclusion that articulate speech could be transmitted and reproduced electrically. His device consisted of a variable resistance transmitter, in which a light metal rod attached to a diaphragm vibrated vertically in a vessel of water in response to the voice. The varying resistance of the interposed water produced corresponding variations in the strength of the current. His

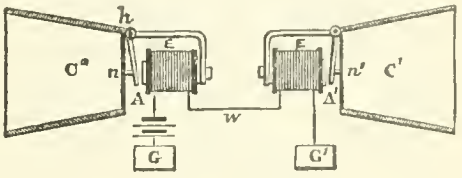


FIG. 7.

receiving instrument consisted of an electro-magnet with a piece of soft iron attached to a membrane diaphragm directly in front of its poles. Bell also suggested this device. In 1878 Prof. D. A. Hughes announced that if two conductors, notably of carbon, be held in very light contact, the resistance of the joint to an electric current passing through it would be modified by the slightest sounds in its vicinity. He named devices of this nature "microphones."

Edison's Carbon Transmitter.— At some time previous to this Thomas A. Edison, of New Jersey, began a series of experiments with telephones, using a Reis transmitter, and a receiver similar to that of Bell and Gray, with the exception that the diaphragm he used was entirely of iron. He soon abandoned the Reis transmitter for devices of his own in which plumbago, lampblack, graphite and carbon were employed to vary the resistance of the circuit. This variation, according to Edison, was due to differences in pressure, and his transmitters were constructed with that end in view instead of

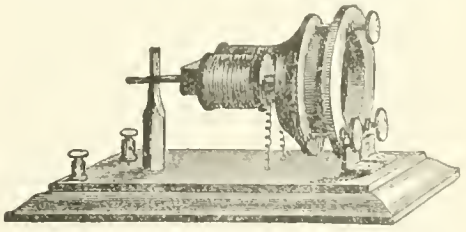


FIG. 8.

providing a loose contact as advanced by Hughes in the microphone. M. Emile Berliner employed similar means to those of Edison, using metal

electrodes; but the carbon transmitter by reason of the far greater volume of sound which it produced, and the clearness of its articulation, soon became the commercial instrument.

Other Investigations.— The history of the telephone includes the names of Varley, Phelps, Thompson, Houston, Dolbear, McDonough, Drawbaugh and many others. This sketch would be incomplete without reference to Graham Bell's "photophone" which he produced in conjunction with Sumner Taintor. The photophone utilizes the property of selenium to change its electrical resistance in response to variations of light. This property was discovered by Willoughby Smith in 1873. Bell and Taintor's apparatus consisted of a plane mirror of flexible material, like mica, which reflected a beam of light through a lens to a parabolic mirror. The latter concentrated it again upon a "selenium cell." This cell was included in a circuit with a battery and a pair of telephones. When articulate speech was uttered in front of the mirror diaphragm the rays of light reflected from it were more or less diverged, and a corresponding variation of resistance took place in the selenium where the light was again focused. This variation of resistance produced the variations of magnetic strength in the telephones, necessary for the reproduction of speech. The volume of sound was small. See TELEPHONY, WIRELESS.

JOHN R. PADDOCK, PH.B.,
Member of the American Association for the Advancement of Science; U. S. Government Expert in Telephone Suits.

Telephone Systems, Independent. Telephone systems not operating under license from the American Telephone and Telegraph Company, of Boston, are called independent, in distinction from systems which are so licensed. For the 17 years prior to 1893 the predecessors of the American Telephone and Telegraph Company (commonly called the Bell Company) had a monopoly of the telephone business of the United States under the original Bell patents. During that time every means which the ingenuity of the counsel and expert advisers of the Bell Company could suggest was employed to secure a continuance of the monopoly of the telephone business. Employees were stimulated to make applications for patents upon every improvement, no matter how trifling, and patents issued on such applications to the number of thousands became the property of the Bell Company and its subsidiary companies. As a result of the telephone business in the hands of the Bell Company for the 17 years when it thus had an absolute monopoly, there were in use in 1893 about 600,000 telephones. When the Independent movement began it was met with the most determined opposition by the Bell Company, and was threatened with lawsuits upon patents, particularly upon the Berliner patent, which, after having been held in the Patent Office for 14 years from the date of application, was issued in the fall of 1891, and by its terms covered every form of efficient telephone transmitter. Under the circumstances capital was reluctant to enter into so precarious an enterprise as the Independent telephone business seemed to be at that time, and development, therefore, in the early years was slow; but as the success of the earlier Independent exchanges was demonstrated, notwithstanding the efforts of the Bell Company to stifle competition, this movement grew. The Berliner patent was found to be invalid in a noteworthy decision, reported in the 109th volume of the 'Federal Reporter,' and the Independent telephone business, under the stimulus of public demand, especially from the rural districts, which had been neglected by the Bell Company in the development of telephonic communication, advanced by leaps and bounds, until in the year 1904 there were probably eight times as many telephones in use in the United States as there were in 1893; of these probably considerably more than half of the total number are Independent telephones.

Farm Telephones.— An important feature of this development is in connection with the use of telephones among farmers. Farm telephone lines are now found in almost every part of the country, uniting the homes of farmers by means of party lines, which permit of conversation between the different stations upon the line, as well as from any station to a central exchange. This has resulted in removing the isolation of farm life to a measurable extent. It is estimated that nearly 500,000 American farmers have been placed in touch with their markets, their own communities and the cities near them by the Independent telephone movement. The extension of this movement has been more noticeable in the West, but the Middle and Eastern States are taking it up. One exchange in central Michigan, operated by a farmers' company, connects 100 families, covering 40 square miles of territory, at a cost of $3 a year for each telephone. This line was built by the subscribers and is operated by them, the local exchanges being in the country mills. It is reported that in one Ohio county there are more than 1,000 patrons of a consolidated rural Independent telephone service. When the Independent telephone movement began in Indiana there were no farmers' telephone lines. Now there are more than 20,000 in that State. In Ohio there are nearly 7,000 Independent telephone exchange systems; in Indiana nearly as many, and in Illinois about 300. The farmers' telephone is used in numerous ways for securing information regarding market quotations, and numerous instances are reported of great financial advantage resulting to farmers from information secured through the telephone. The telephone also is used for general purposes of communication among farmers, and it is frequently the habit in a farmers' community supplied with a telephone system for the telephone to be taken down at a certain hour by each of the subscribers, and thus a general conversation among the farmers, who may be many miles apart, is permitted.

City Service.— The development of the Independent telephone business, however, is not limited to the country districts, but has established itself upon a permanent and lucrative basis in many cities, such as Rochester, N. Y., Saint Paul and Minneapolis, Saint Louis, Indianapolis, Kansas City, and Salt Lake City. It has been demonstrated that the argument that the telephone is a natural monopoly and that only one telephone exchange can exist in a city is not well founded, at least under present conditions. In many cities there are two telephone exchanges existing and doing business side by side, and in many cases where Independent companies are in

competition with exchanges of the Bell Company, the Independent company has succeeded in distancing its competitor.

Operation.—The following estimates from a prominent Independent telephone manufacturer of the cost of installing and maintaining Independent telephone systems in cities of 10,000 and 50,000 population, and of the cost of installing a farmers' party line, are given as an illustration of the small expense of such service compared with the very great convenience which arises from the use of a telephone.

ESTIMATE ON A TELEPHONE EXCHANGE SYSTEM.

Number of telephones..... 900
Population of city.....10,000

Estimate to cover the cost of erection and maintenance of a telephone exchange in a city of 10,000 inhabitants, equipped with 900 independent line telephones of copper metallic circuits.

Cable System:

Number of miles of cable pairs, per subscriber line	1.20	
Cost per mile of cable pair erected..	$33.60	
Cost of cable per subscriber line.....	40.32	
Total cost of cable for 1,000 subscribers, at $40.32.....		$40,320.00
Aerial Wire Construction:		
Number of miles of metallic No. 12 copper circuits, per subscriber line.	.20	
Cost of No. 12 copper metallic circuit erected on exchange poles, per mile	$45.00	
Cost of metallic circuit, per subscriber	9.00	
Total cost of copper metallic circuits for 900 subscribers, at $9.00.....		8,100.00
Pole Line Construction:		
Number of poles, per subscriber line.	1.50	
Cost of erecting 40-foot poles equipped with cross-arms, each.....$15.00		
Cost of erecting poles, per subscriber.	22.50	
Total cost of pole line construction for 900 subscribers at $22.50.....		20,250.00
Cable Pole Protection and Terminol Boxes:		
Cost of cable pole protection, per line.$	1.25	
Total cost for protecting 900 lines, at $1.25		1,125.00
Connecting Sub-stations:		
Cost of wiring and installing substation equipment, each.....$	4.00	
Total cost of wiring and connecting sub-stations, at $4.00.....		3,600.00
Cost of construction tools.....		500.00
Total cost of construction.....		$73,895.00
Total cost of construction work per subscriber		82.10
Central Office:		
Total cost of central office and furniture		$ 8,000.00
Cost per subscriber.....$	8.88	
Central Office Equipment:		
Total cost of lamp line signal central energy non-multiple switchboard..		$ 7,548.90
Cost per subscriber.....$	8.38	
Sub-Station Equipment:		
Cost of telephones per subscriber.....$		10.00
Total cost of telephones for 900 subscribers		9,000.00

RÉSUMÉ.

Total cost of construction work.....	$73,895.00
Total cost of central office building.....	8,000.00
Total cost of central office equipment.....	7,548.90
Total cost of telephones.....	9,000.00
Grand total cost of exchange.....	$98,443.90
Total cost of exchange per subscriber .....$	109.38

ESTIMATE ON COST OF MAINTENANCE AND DEPRECIATION FOR A TELEPHONE EXCHANGE SYSTEM.

Number of telephones..... 900
Population of city..... 10,000

Operation and Maintenance:		
900 lines at $9.50.....$		8,550.00
Depreciation:		
Total cost of switchboard and sub-station equipment .....$	16,548.90	
Depreciation 7½ per cent	$1,241.17	
Cost of cable plant.....$	40,320.00	
Depreciation, 3 per cent.....	1,209.60	
Cost of aerial wire construction .....$	8,100.00	
Depreciation, 3 per cent.....	243.00	
Cost of pole line construction .....$	20,250.00	
Depreciation, 7½ per cent.....	1,518.75	
Cost of sub-station wiring .....$	3,600.00	
Depreciation, 10 per cent.....	360.00	
Cost of building.....$	8,000.00	
Depreciation, 3 per cent.....	240.00	
Total depreciation		4,812.52
Interest:		
Total cost of plant.....$	98,443.90	
Interest, 6 per cent.....		5,906.63
Grand total — maintenance and operation, depreciation, and interest.....$		19,269.15
Total, per line.....	$21.41	

ESTIMATE ON A TELEPHONE EXCHANGE SYSTEM.

Number of telephones..... 3,600
Population of city.....50,000 to 60,000

Estimate to cover the cost of erection and maintenance of a telephone exchange in a city of 50,000 to 60,000 inhabitants, for the immediate operation of 3,600 independent line telephones, of copper metallic circuits, making necessary provisions for an increase to 5,000 lines capacity:

Cable System:

Number of miles of cable pairs per subscriber line	1.60	
Cost per mile of cable pair erected..	$33.60	
Cost of cable per subscriber line....	53.76	
Total cost of cable for 3,600 subscribers, at $53.76.....		$193,536.00
Aerial Wire Construction:		
Number of miles of metallic No. 12 copper circuits, per subscriber line	.25	
Cost of No. 12 copper metallic circuit erected on existing poles, per mile.$	45.00	
Cost of metallic circuit per subscriber	11.25	
Total cost of copper metallic circuits for 3,600 subscribers, at $11.25..		40,500.00
Pole Line Construction:		
Number of poles per subscriber line	1.20	
Cost of erecting 45-foot poles equipped with cross-arms, each...$	17.50	
Cost of erecting poles per subscriber.	21.00	
Total cost of pole line construction for 3,600 subscribers at $21.....		75,600.00
Cable Pole Protection and Terminal Boxes:		
Cost of cable pole protection, per line	$1.25	
Total cost for protecting 3,600 lines at $1.25.....		4,500.00
.. *Underground Conduit System:*		
Cost of underground conduit system per subscriber..... $	8.00	
Total cost of underground conduit system for 7,000 lines.....		56,000.00
Connecting Sub-stations:		
Cost of wiring and installing substation equipment, each..... $	4.50	
Total cost of wiring and connecting 3,600 sub-stations, at $4.50.....		16,200.00
Construction Tools:		
Cost of construction tools.....		1,500.00
Total cost of construction.....		$387,836.00
Total cost of construction work per subscriber .....$	107.73	
Central Office Building:		
Total cost of central office and furniture		$22,000.00
Cost of central office per subscriber..	$6.11	
Central Office Equipment:		
Total cost of lamp line signal, relay multiple, central energy switchboard, 4,800 ultimate capacity, 3,600 lines present.....		$66,474.80
Cost of central office equipment per subscriber .....$	18.46	
Sub-station Equipment:		
Cost of telephones per subscriber....$	10.00	
Total cost of telephones for 3,600 subscribers		$36,000.00

RÉSUMÉ

Total cost of construction work.....$	387,836.00
Total cost of central office building.....	22,000.00

Total cost of central office equipment		$66,474.80
Total cost of telephones		36,000.00
Grand total cost of exchange		$512,310.80
Total cost of exchange per subscriber		$142.30

ESTIMATE ON COST OF MAINTENANCE AND DEPRECIATION FOR A TELEPHONE EXCHANGE SYSTEM.

Number of telephones..... 3,600
Population of city..50,000 to 60,000

Operation and Maintenance:			
3,600 lines at $16.00			$57,600.00
Depreciation:			
Total cost of switchboard and substation equipment	$102,474.00		
Depreciation 7½%		$7,685.55	
Cost of cable plant	193,536.00		
Depreciation 3%		5,806.08	
Cost of aerial wire plant	40,500.00		
Depreciation 3%		1,215.00	
Cost of sub-station wiring	16,200.00		
Depreciation 10%		1,620.00	
Cost of pole line construction	75,600.00		
Depreciation 7½%		5,670.00	
Cost of underground system	56,000.00		
Depreciation 2%		1,120.00	
Cost of building	22,000.00		
Depreciation 3%		660.00	
Total depreciation			$23,776.63
Interest:			
Total cost of plant	$512,310.80		
Interest 6%			30,738.65
Grand total — maintenance and operation, depreciation, and interest			$112,115.28
Total, per line			$31.14

ESTIMATE ON THE CONSTRUCTION OF A FARMER LINE.

The following estimate covers the construction of a farmer line 10 miles in length, providing 25-foot poles, 5-inch tops, 25 per mile equipped, with a 6-pin cross-arm, and line wire, to consist of one metallic circuit of No. 12 B. B. galvanized iron wire and have connected thereto 15 five-bar, 1,600-ohm ringer telephones.

Estimate as follows:		
Cost of line per mile, 25-foot, 5-inch tops poles, at $1.70	$42.50	
25 6-pin cross-arms with pins at 30c	7.50	
50 pony glass insulators, No. 9, at 1½c	.75	
2 miles of No. 12 B. B. galvanized iron wire, 330 pounds, at 4½c	14.85	
Total for material		$65.60
Setting 25 poles, each $1.00	$25.00	
Framing 25 poles, each 20c	5.00	
Hauling 25 poles, each 25c	6.25	
Stringing two miles of wire, at $4.00	8.00	
Guying, per mile	10.00	
Total for labor, per mile		54.25
Total per mile		$119.85
Miscellany, 5%		5.99
		$125.84
10 miles of circuit at $125.84		$1,258.40
Telephones:		
15 5-bar, 1,600-ohm telephones, at $13		195.00
Installing telephones, 15 at $5.00		75.00
Total		$1,528.40

Another field which has been and will undoubtedly be developed by the Independent telephone movement is that of interior telephone systems, that is, systems for intercommunication in large offices, office buildings, hotels and factories. A result of general advantage to the community from the Independent telephone movement is the improvement in the service in all exchanges. The representatives of the Bell companies are coming to realize that success in competition with the Independent telephone companies depends not upon any supposed monopoly (which has been found to be indefensible), but upon the service which is offered to the community and upon furnishing this service at reasonable prices. It is only in the large cities that the methods which have been characteristic of some of the Bell telephone companies are continued in effect, and extortionate prices are charged, while improvements are being made and the service is made more rapid and reliable.

CHARLES A. BROWN,
Patent Attorney, Chicago.

Telephone Systems, Cost of Installing and Maintaining. See TELEPHONE SYSTEMS, INDEPENDENT.

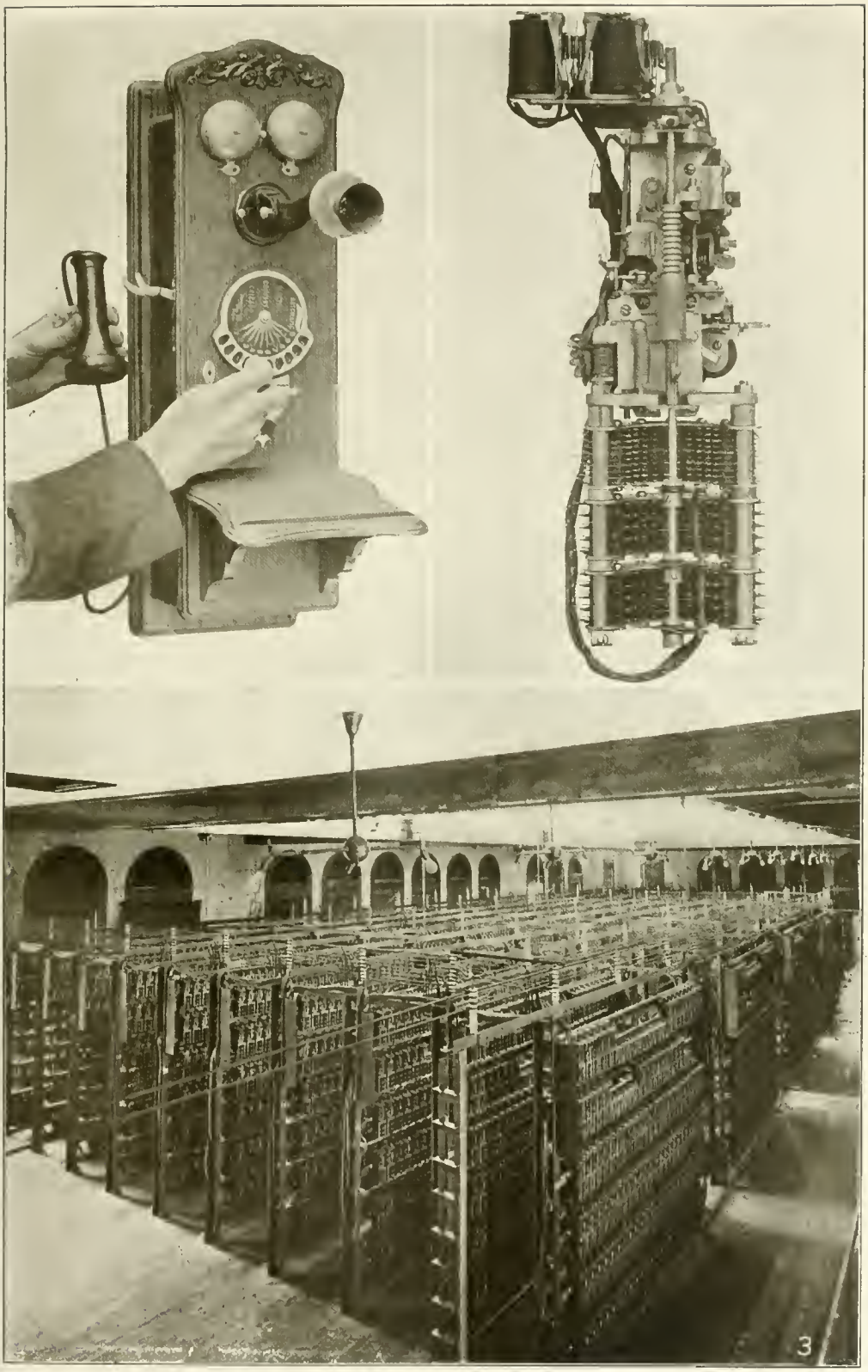
Telephone Transmitters. See TELEPHONES.

Telephones, Farm. See TELEPHONE SYSTEMS, INDEPENDENT.

Telephones, Electrical. See TELEPHONE.

Telephony, Automatic. The spirit of the present age is not better shown forth than by the ever-increasing demand which industry, pressed by the keenness of competition, is making upon genius for the invention of labor-saving and time-saving machinery; and nothing pays higher tribute to the breadth of the human intellect than the character of the machinery which has been evolved as the result of this insistent call. Indeed, we are sliding rapidly into an automatic age. The work that once was done by hand, then by hand-guided machines, is now done by automatic devices. Scarcely a large, up-to-date factory but has in one or more of its departments a battery of automatic machines busily engaged in turning out such things as screws, buttons, tin cans, cloth, shoes, or a thousand other varieties of useful articles from the raw material, with surprising nicety and tremendous speed, reducing the cost of manufacture to a minimum and widening the field of sale. We have wondered at the ingenuity of these machines and marveled at their cleverness, but we have looked upon their invention and introduction as something that was bound to come, as only another step in the logical order of things. We have waited for them, and have not, therefore, been surprised at their successful advent.

Few of us, however, as we have stood befor a telephone box, wiggling a switch hook, or whirling the crank of the hand generator, and impatiently waiting for time and the "Hello girl" to bring us our connection, have ever gone so far as to hope, or even conceive the idea, that this genius who had so long presided over the central office would ever be unseated and her place occupied by an iron machine whose speed and accuracy would discount her best performances; and yet that day is here. The States are already dotted with automatic telephone exchanges, which are giving service to thousands and thousands of subscribers, and with such success that it is not hazarding anything to predict that a few years will see the absolute divorce of the operator from the exchange room — except, of course, for long-dis-



1. Automatic Telephone Switch. Front View.
2. Wall Telephone, Showing Method of Operating Dial and Making Call.
3. Automatic Telephone Exchange, Dayton, Ohio. Perspective View of Switchboards

tance calls, for which her services will probably always be needed.

Historical Retrospect.—The application of the automatic idea to telephony is not new It is considerably more than a decade since Strowger, an obscure Chicago engineer, brought out the first automatic telephone. The Strowger Automatic Telephone Company and the installation of a number of small exchanges resulted. These exchanges were successful, not so much in what they actually accomplished in the way of improved service, as in the promise they gave of future development in that direction. The apparatus was crude, imperfect, and complex; but the fundamental ideas involved were right and required only better expression.

Ten years passed, 10 years of experiment and persistent effort. Strowger died. The Automatic Electric Company was organized to take over the Strowger patents. Further experimenting was done, and greater capital expended. The result has been a system from which the imperfections have been eliminated, a system which is scarcely more complex than the manual switchboards now in general use. The limit of capacity is no longer reached at 1,000 stations. In fact, the business of the very largest city can be handled as efficiently and conveniently as that of a town which requires but a hundred telephones. In Chicago to-day an automatic exchange of 10,000 stations is already in operation; and others will be added as occasion demands, the ultimate purpose being to handle the business of the entire city.

The Automatic Mechanism.— A study of the apparatus which has made all this possible will, no doubt, be interesting and instructive. The telephone itself resembles, in many particulars, the manually operated telephones with which we are so familiar. It consists of the usual transmitter, receiver, bells, battery, and induction coil, adding only a calling dial, a circular metal piece, on the periphery of which are 10 finger holes numbered 1–2–3–4–5–6–7–8–9–0. A stop is provided at the lower end of the holes to limit the distance which the dial may be made to revolve.

How a Call is Made.— The method of calling is very simple. To secure a number, say 761, the subscriber first takes the receiver from the hook; then, placing his finger in hole number 7, pulls the dial around to the stop above mentioned. When released, the dial is instantaneously restored to its normal position. The subscriber is now connected to a trunk line leading to the seventh group of so-called "connector" switches, which we may call the "seven hundredth" group. In the same manner he calls 6 and 1 in this group. Having turned the number desired, he presses a button underneath the dial, which rings the bell of the person wanted, and the connection is completed. In the event that the 'phone of the subscriber called is busy at the time of the call, a vibratory sound in the receiver of the caller notifies him that such is the case.

The keyboard or internal mechanism of the telephone occupies a space 5 x 3 x 2 inches, and consists of an impulse-sending mechanism, which, in response to the rotations of the dial, communicates to the subscriber's switch a number of impulses corresponding to the number of the hole in which the finger is placed, lifting the shaft which occupies the central position of the switch, up to the proper row of contacts, and bringing the "wiping fingers" fastened thereto into connection with the proper contact in that row.

It should be understood that, when the call is made, no impulses are sent over the line on the down movement of the dial, but on the return. This is arranged for the protection of the instrument against careless or hasty subscribers. The return of the dial is regulated by a governor which always insures proper speed.

The calling mechanism may be said to be perfect. It is simple, and works with remarkable accuracy, speed, and precision.

The Switch.—The switch, shown in the accompanying illustration, is a device about 13 inches in height, 4½ inches in depth, and 4 inches in breadth. The upper half of this device consists of two relays and three pairs of magnets mounted on a solid cast metal base. These relays and magnets, together with the proper springs, wires, etc., operate a vertical rod in the centre, in obedience to the impulses sent from the subscriber's telephone, and bring the three pairs of "wiping fingers" attached thereto into connection with the brass contacts, which, arranged in three semicircular banks, constitute the lower half of the switch.

The upper of these banks, known as the "busy bank," serves to indicate busy lines in the automatic selection of trunks. The lower two are "line banks," to which the line wires connect, and over which the conversation is held.

Two classes of switches are employed, one known as "selectors," of which there is one for every telephone connected with the exchange, and the other as "connectors," of which there are 10 for every 100 selectors, and which are in groups each capable of connecting 100 telephones. The function of the selector is to connect the calling telephone with the connector in the proper group, which in turn connects with the telephone desired in that group. This is the case in exchanges of 1,000 capacity or less. In larger exchanges a second selector is employed. This is an intermediate switch, and divides the work of selection with the first selector.

Trunk-selecting System.— The trunking system employed is very much akin to that now generally used in manual practice and, therefore, needs no description here. It may be said, however, that the selection of trunks is automatically accomplished, the "wiping fingers» on the shaft of the selector switch passing over all busy contacts and stopping at the first idle point.

Accessories.—The accessorial equipment consists of a 52-volt storage battery, which furnishes the current for operating the switches; a cross-connecting board or distributing rack, equipped with carbon lightning arresters and heat coil protectors; a ringing machine with "busy back" and "howler" attachment; charging machines; power board, on which are mounted the usual knife switches, circuit breakers, voltmeters, ammeters, etc., necessary for controlling and measuring the current; and a "tell-tale" board.

This last consists of a number of 8-candle-power lamps mounted on a marble panel, to-

gether with a magneto bell. In case of a short circuit or "ground" on any line, the bell rings and the lamp on the panel glows. The position of this lamp instantly indicates to the attendant the exact location of the trouble, and oftimes enables him to rectify it before the subscriber is aware that there has been any trouble.

The automatic switches are mounted on steel shelves, 25 to the shelf, each board containing 4 shelves of first selectors, and 1 shelf of connector switches. This is the arrangement for a system of 1,000 stations. In a 10,000-station system, the board is made up of 6 shelves, 4 of first selectors, 1 of second selectors, and 1 of connector switches. The floor space occupied by such a switchboard is 11 feet 6 inches by 12 inches. The switchboard is made of steel angles and is rigidly braced.

A very important feature of the automatic switchboard is that it can be increased to any capacity by simply adding new sections with the desired number of switches mounted thereon, without in any way interfering with existing conditions. Ninety-five per cent of the electric contacts and connections are made at the factory; consequently better results are secured, as well as time and expense saved in installation.

Advantages of the Automatic System.—(1) A switchboard has no operators; and thus one of the large fixed charges incident to manual-exchange operation is eliminated; (2) there being no operators, the automatic exchange can be located in less expensive quarters than the manual. No reading or retiring rooms are needed, no lockers, no lavatories; and the cost of fuel and lighting is reduced; (3) one switchboard attendant, for testing and keeping apparatus in order for 1,000 subscribers, is all that is needed in the automatic practice; (4) the cost of maintenance and interior equipment is no greater, and in large exchanges is less than in the manual exchange; (5) the service which the automatic system gives, unlike that of the manual system, is absolutely secret, each subscriber having a "private wire" on which to transmit his communication — an advantage that cannot be overestimated by the general business man, as well as by the broker, the lawyer, and the physician; (6) the subscriber himself instantaneously connects with the person he wishes to call; and the apparatus is so constructed that it is an impossibility for another subscriber to "cut in" or in any way interfere with the line he is using; (7) the frequent delays and mistakes which the manual board causes are entirely unknown to users of automatic telephones. The switches do not make errors nor gossip; are never weary or sleepy; are not interested in subscribers' affairs; and are not impudent; (8) the complexity of the automatic exchange does not increase proportionately to the increase of size, as is the case with manual exchanges, where the cost of giving service is much more per subscriber in large than in small exchanges. The cost of operation in the automatic exchange is fixed. An increase is merely a matter of adding new telephones and switches, the cost of operation being the same per subscriber; (9) the automatic switch is thoroughly cosmopolitan in its nature, no interpreter being needed by the foreigner in a country where the automatic exchange is located, any person being able to secure the desired connection by simple rotation of the dial; (10) the same number of automatic switches are always at work, night and day, (11) quick connections, instantaneous accommodations, prompt answers, accuracy, and promptness, with the busy signal given when subscriber called is busy.

H. S. Durant,
Of the Automatic Electric Company, Chicago.

Telephony, Wireless. The new art of transmitting articulate speech over a distance without wires, or wireless telephony, has followed in natural order the laws of evolution for the electrical communication of intelligence. Thus in the sequence of progress, the telegraph with wires was first invented, then the telephone with wires, following came the wireless telegraph, and finally the wireless telephone.

The difficulties of transmitting speech with and without wires are greater than the conveying of mere signals, since in the former, currents of the same amplitude, phase and frequency with the local vibrations must be retained, while in the latter any kind of electric impulses will serve. In wireless telegraphy where a spark-gap and coherer is used, the energy is emitted in trains of waves as shown in Fig. 1, with long

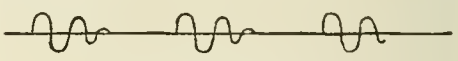


Fig. 1.— Electric waves.

periods between each series of radiations, and it is evident, therefore, that this method cannot fulfil the requirements of a sine wave for the propagation of speech as indicated in Fig. 2.

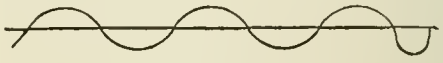


Fig. 2.— Undulating electric current.

To overcome the obectionable features recourse was had to a number of other methods.

The first and oldest is that of dispersion of electricity through the earth or water; four metal plates, A B C D, Fig. 3, are earthed at

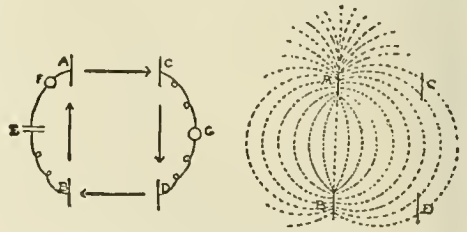
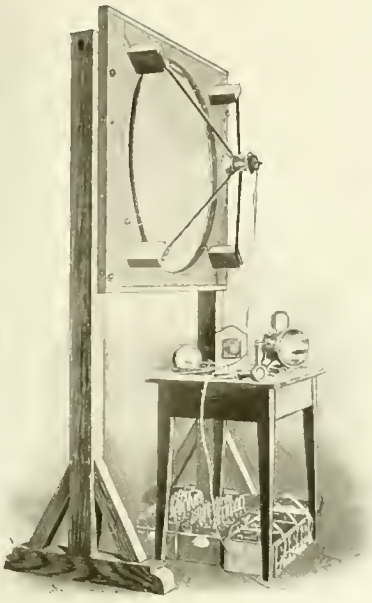
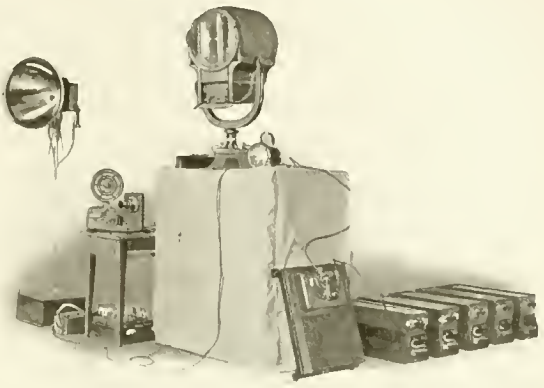


Fig. 3.— Dispersion method. A B C D, copper plates in earth; E, battery; F, transmitter; G, receiver.

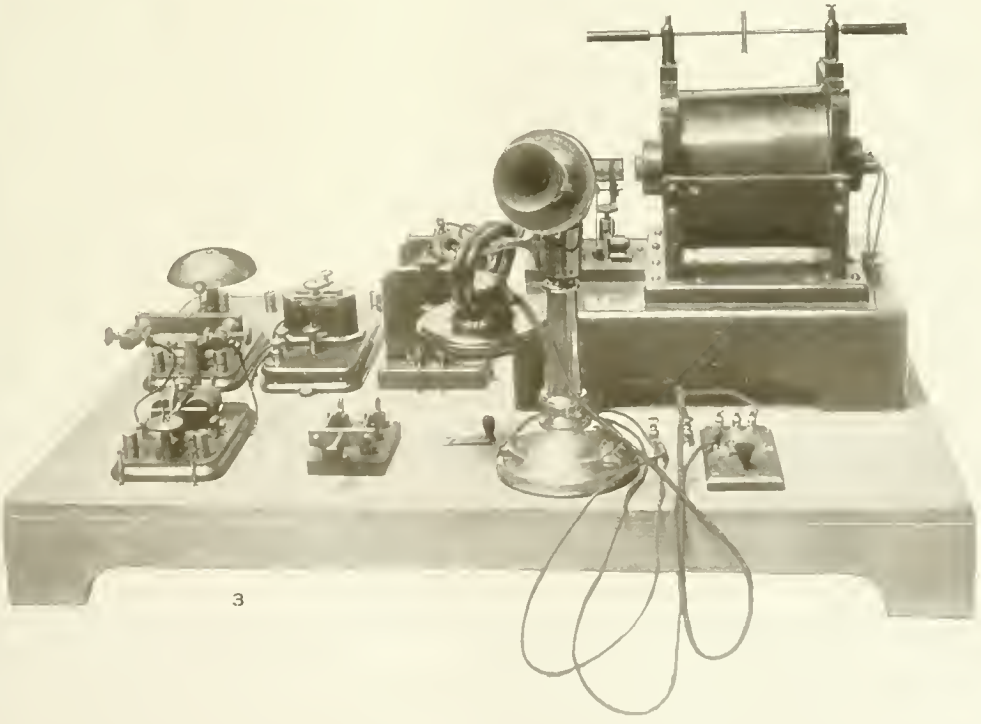
convenient points; A B are joined with a length of wire including a battery and transmitter, and C D are likewise connected in series with a receiver; when the current flows from the battery through the wire to A B the return circuit is joined by the earth and owing to its



1



2



3

1. Ruhmer Photo-electric Telephone Receiver
2. Ruhmer Photo-electric Telephone Transmitter. 3 Collins Wireless Telephone.

great cross-section and conductibility the current flow follows innumerable lines forming a hemispheroid; when these stream lines of force impinge on C D, the circuit, offering a smaller resistance than the earth separating them, acts upon the receiver and the voice is reproduced.

Wireless telephony by electro-magnetic induction is an ideal laboratory method for demonstrating its possibilities. In Fig. 4 A B illustrate two closed coils of wire, each of which has one of its convolutions cut; in the first a battery and transmitter is inserted and in the second a receiver. When spoken into, the transmitter varies the current flowing in A and instantly the coil is surrounded with curved lines of magnetic force which spread out in circles until they intersect the wires of the second coil; the magnetic lines are then changed into electric

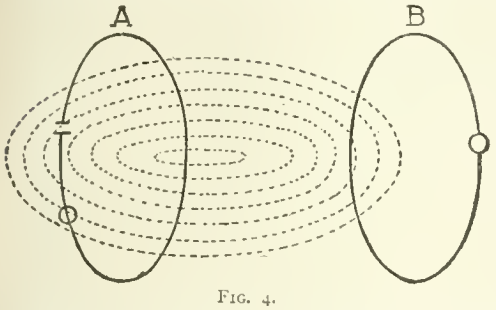


FIG. 4.

currents in the coil and are of exactly the same phase and frequency as the vibrations of the voice producing them, and which the receiver translates into speech. Alexander Graham Bell devised an apparatus for transmitting speech by a beam of light. This he termed a radiophone; in this instrument shown in Fig. 5, a ray from the sun or an electric light was reflected by a plane mirror 1, through a convex lens 2, where it impinged on a concave mirror 3, attached to the diaphragm of a telephone transmitter 4; the converged beam of light was now reflected from the concave mirror through the lens 5 and thence through space a short distance to the receiver; here the divergent rays were concentrated by a parabolic mirror *a* into a pencil of light on the cell *b*, the terminals of this cell are connected to the battery *d* and the telephone receiver *c*. Now selenium possesses the very remarkable property of varying its resistance under the action of light, and when the spoken words caused the diaphragm to vibrate the intensity of the projected light varied accordingly, thus affecting the selenium, which in

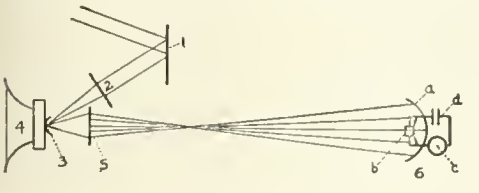


FIG. 5.— Bell's Radiophone.

turn permitted more or less current to flow through the receiver.

Ernest Ruhner has improved upon Bell's apparatus by substituting a speaking arc for the ray of the sun. The speaking arc was invented by H. T. Simon, who found that by superimposing an alternating current set up by the vibrations of the diaphragm of a telephone transmitter on a direct current operating an arc lamp, the emitted light also reproduced the voice. This was the form of transmitter Ruhner employed in his photo-electric telephone, but rendered it more effective by placing the arc in the focal line of a parabolic reflector; his receiver was similar to that described in Bell's photophone, except that a selenium cell of much greater sensitivity was used; with this apparatus Ruhner succeeded in transmitting articulate speech over a distance of one and a half miles.

The wireless telephone of A. Frederick Collins is based on experiments for producing a pure sine wave. It has been shown that electric waves are periodic, and their maxima decreases in geometric progression. By the addition of large inductances in the form of coils and large capacities in the form of condensers it was found possible to slow down the oscillations to a point where a telephone receiver would respond directly to the waves without interposing a wave detector.

The propagation of electric waves depends upon their length and the medium through which they pass. Red waves of light pass through fog easier than blue or green, while long electric waves from oscillators of wireless telegraph systems penetrate it with still less loss of energy, and with exceedingly long waves generated by a wireless telephone emitter the bound ether of the earth offers a good medium for their propagation, just as mediums of greater density transmit sound waves to greater distances.

Water offers but little resistance to the long distance transmission of these waves, paralleling the case of wireless telegraphy. By the Collins method messages have been transmitted a distance of three and a half miles. It is proposed to use the system to prevent collisions between vessels in harbors and at close range at sea.

A. FREDERICK COLLINS,
Author of 'Wireless Telegraphy: Its History, Theory and Practice.'

Tel'ephot, or Telephote, an instrument perfected in 1903, designed to reproduce scenes at a distance, by the aid of electricity. Telephotography is likely to prove useful both for scientific and industrial purposes, as well as in warfare. The physicist will be able to photograph any phenomenon visible at the extreme horizon, such as mirages, etc., as well as those which he could not approach himself without danger, such as, for instance, volcanic eruptions. The naturalist may now safely observe wild animals and photograph them from a distance. The amateur astronomer will be in a position to take splendid views of the principal heavenly bodies. The explorer of Arctic regions will observe distant and inaccessible points. Archæologists and architects will use the apparatus to fix on the photographic plate, buildings and monuments too distant to be taken with an ordinary apparatus. Military and naval officers will be able to observe and to study the movements of the enemy (the apparatus may in fact be well used as a telescope); finally, all topographical measurements will highly profit by this ingenious apparatus.

Telescope. The telescope is an optical instrument by the use of which distant objects are made to appear near, so that they may be examined as if they were but a fraction of their actual distance from the observer. This instrument was invented by the Dutch optician, Lipperhey, early in the 17th century. The first use of it for astronomical observations was made in Florence, by Galileo, who in 1609 invented the type known as the Galilean Telescope.

The many and widely varying forms of telescopes may all be grouped simply as tubes (Milton, seeing Galileo's in Florence, called it the «Optik Tube»), in which are placed the several

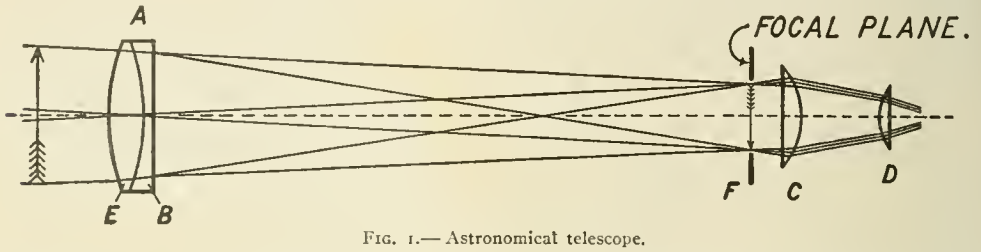


FIG. 1.— Astronomical telescope.

combinations of lenses or reflectors; each combination, however, producing the one result, namely, first, gathering the light from the object and concentrating it at the focus in a brilliantly illuminated but small image; and, second, magnifying this image with a microscope, usually called an eye-piece. One of the common types is the refracting astronomical telescope (Fig. 1), in which A is the object-glass or objective, and F the focus, where the small image is formed. The two lenses, C and D, form the microscope or eye-piece, which magnifies this image formed at the focus by the concentrating power of the mirror A to the focus F, where the image is magnified by the eye-piece as before.

In these three forms of telescopes the image of the object as seen through the eye-piece is necessarily inverted, which is, of course, unimportant in astronomical observations but is a defect to be overcome in the terrestrial instrument. The most common type of terrestrial telescope is the Spy Glass (Fig. 4). The objective A has the same office as in the refracting astronomical telescope, and forms an illumined image of the object at the focus F. This image is then magnified by a compound eye-piece made up of the several lenses B C D and E, which carry the light to the eye in such manner as to erect the image and show it in its natural position. Fig. 5 represents the Galilean telescope, which is the same in principle as the ordinary opera glass. In this case the objective A condenses the light from the object observed, and would naturally make a small image at F, but the cone of rays, before reaching the focus, is intercepted by the double concave eye-piece C, and thence conveyed to the eye in erect position. Fig. 6 shows the Porro Prism instrument, the most modern and efficient form of terrestrial telescope. The objective and the lenses

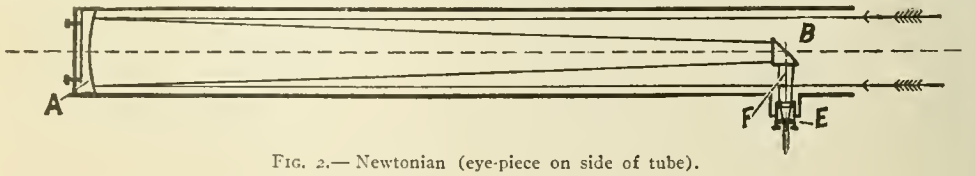


FIG. 2.— Newtonian (eye-piece on side of tube).

objective. Fig. 2 represents the reflecting astronomical telescope as invented by Sir Isaac Newton, and called the Newtonian Reflector. In this the light traverses the entire length of the tube, at the lower end of which it strikes the concave reflector A, which sends it back as a cone of rays to the diagonal reflector B; thence it travels to the focus F, where it is magnified by the eye-piece E, as in the refracting telescope. Fig. 3 represents the most popular form of reflecting telescope, called the Cassegrainian. The optical principles here are the same as in the Newtonian form except that the convergent cone of rays from the mirror A is intercepted by a convex reflector B and sent back through an opening in the centre of the

are in the same relation to each other as was first illustrated in the astronomical telescope, Fig. 1. Two double-reflecting, 90-degree prisms are inserted within the cone of rays between the eye-piece and the objective (Fig. 6); their mission being to erect the image which, in the ordinary refracting telescope, is shown inverted. This system was the invention of the Italian en-

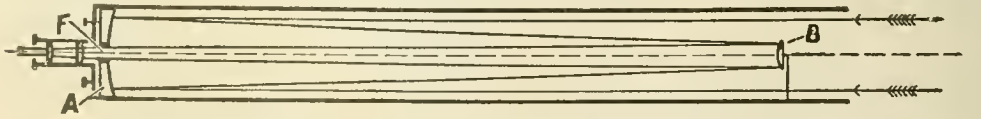
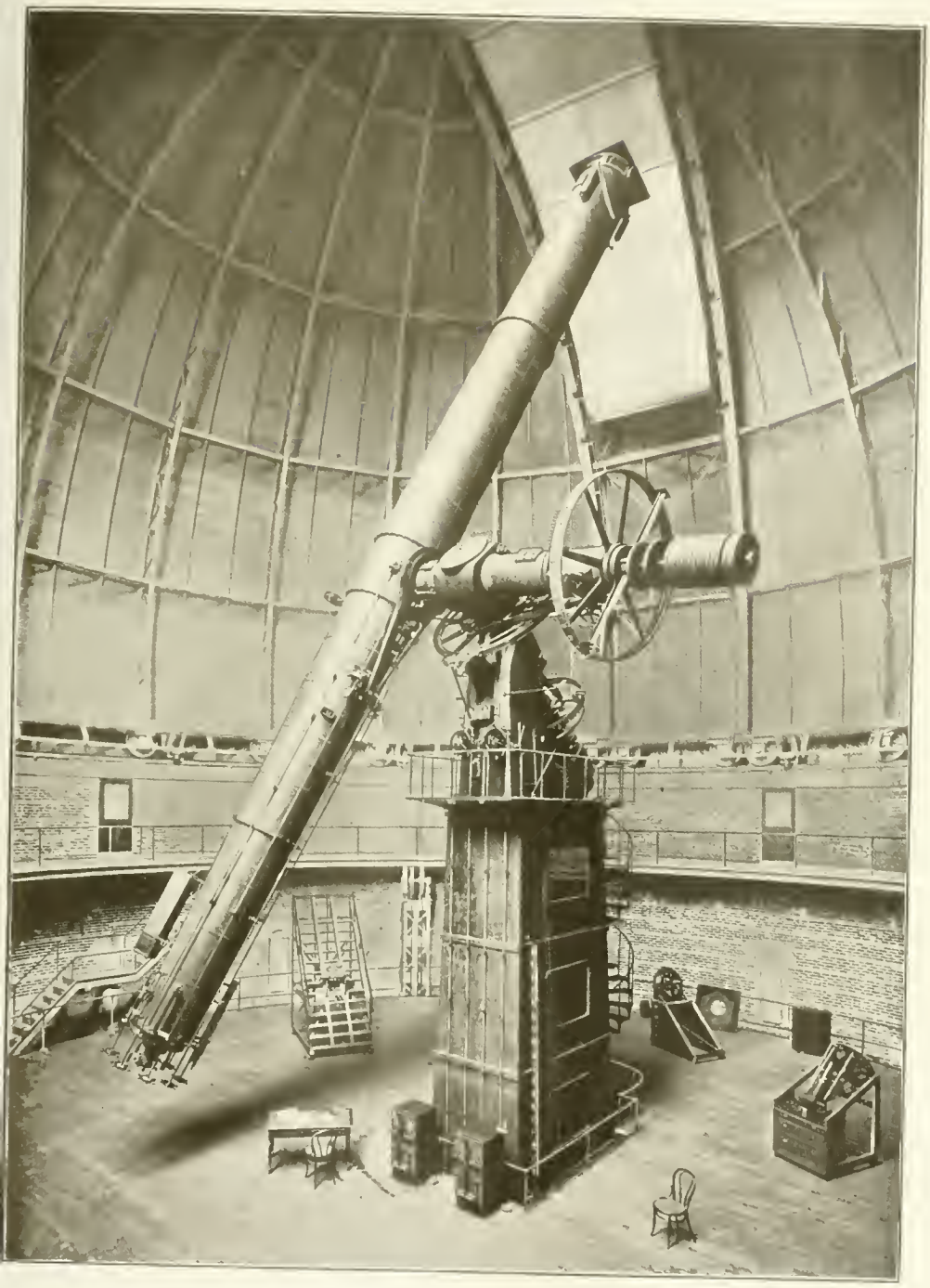


FIG. 3.— Cassegrainian (secondary mirror convex).

gineer, Porro, who patented it in France about 1850.

The magnifying power of telescopes is usually expressed in diameters and is indicated by the ratio of the focal length of the objective to that of the combination of lenses forming the eye-piece. For example, the Lick telescope has a focal length of 56 feet or 672 inches. If,



YERKES TELESCOPE.

therefore, an eye-piece of one inch focus is used in this telescope, the power resulting will be 672, and eye-pieces of longer or shorter focus will give correspondingly lower or higher powers. The practical limit of power in telescopes of the highest degree of accuracy is usually considered to be about 100 diameters per inch of aperture. Thus the 36-inch Lick Telescope may be practically used with an eye-piece which would give a power of 3,600 diameters. Such high powers are, however, seldom required and can be used only in the clearest atmosphere. By far the larger proportion of astronomical observations are made with powers of less than 1,000 diameters. In telescope observations, the two elements "power" and "light," while equally

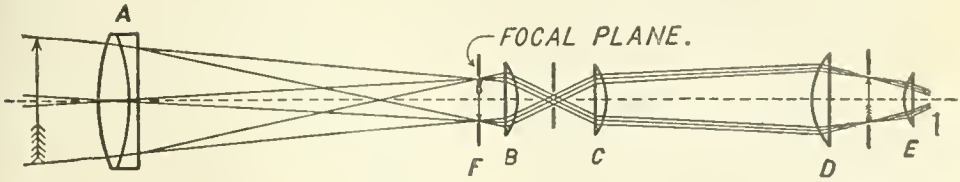


FIG. 4.— Terrestrial telescope (spy glass).

important, are always in opposition. Thus an object viewed with a power of 100 diameters is four times as brilliantly illuminated as would be the case if an eye-piece giving 200 diameters were used. It follows, therefore, that the observer will use the power best adapted to his purpose, both as to magnification and light.

The telescope giving the minimum power is the opera glass, usually magnifying 2½ or 3 diameters, which is sufficient for indoor use, while for outdoor use the Galilean binocular has a power of 4 or 5 diameters, and the Prism binocular of 6, 8, 10, or even 12 diameters. The 8-power is, however, considered as high as can

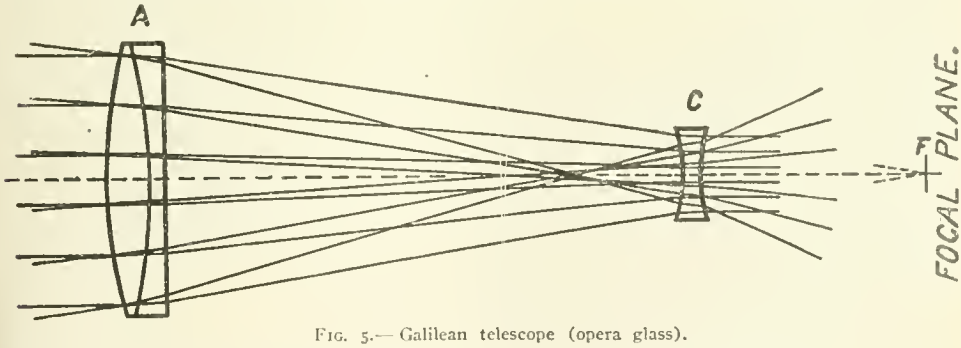


FIG. 5.— Galilean telescope (opera glass).

be held in the hands with sufficient steadiness to give the best results. The power used in terrestrial telescopes steadily mounted on a tripod usually ranges from 15 to 100 diameters, depending on the condition of the atmosphere.

The most important element in a refracting telescope is the objective, and, in a reflecting telescope, the mirror or speculum. The objective of the early refracting telescope was a double convex lens, which could not give a distinct image because it separated each ray of light into its various prismatic colors, and each color, having a refracting power different from the others, found a focus of its own. The red ray, being most refracted, reached its focus first; next came the yellow ray, then the green, and last and nearest of all to the eye-piece, the blue ray made its image. When a star is viewed with such a telescope the image seen consists of a yellowish point at the centre, surrounded by a mixture of green and blue light, with red outside. This difficulty in refracting telescopes, called chromatic aberration, checked the progress of astronomy for 150 years, until, in 1750, the English optician, Dolland, invented the achromatic objective as shown in Fig. 1. In this diagram E is a double convex lens of crown glass, and D a flint-glass lens of nearly plano-concave form. The difference between the crown and flint material in light refraction and dispersion, together with the compensating form of the two lenses results in clear and distinct "definition," the image of the star being sharply outlined and colorless. Optical glass for such lenses is of special manufacture. The world's supply comes from three makers, one each in England, France, and Germany. The mirror or speculum of the reflecting telescope is made from a casting of ordinary glass of sufficient thickness to be handled without flexure. The reflecting surface is ground and polished, with great precision, to a parabolic form of the focus required, and then, by a chemical process, coated with silver, which may be easily renewed when tarnished or otherwise injured.

The making of the optical parts of telescopes is a rare art, which, however, has been cultivated with peculiar success in America. Alvan Clark & Sons of Cambridge, Mass., attained world-wide fame in this connection during the lifetime of the gifted men composing the firm. At the present time the largest reputation as a maker of objectives belongs to John A. Brashear of Allegheny, Pa.

The telescope tube is usually carried by an equatorial mounting. This form of instrument has its principal or polar axis set parallel to the axis of the earth, its inclination therefore corresponding to the latitude of the observatory. At right angles to the polar axis

is the declination axis, which, in turn, carries the telescope tube at right angles to itself. Each

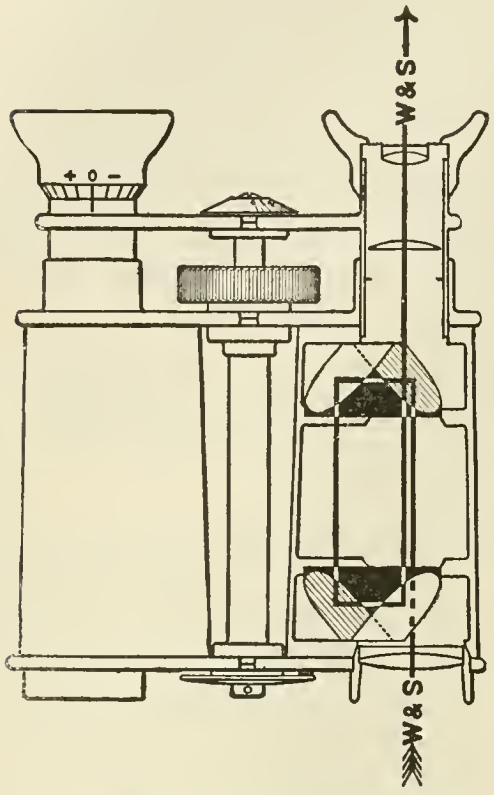


FIG. 6.— Universal Prism field glass (sectional view).

axis is supplied with a graduated circle, indicating, respectively, the position of the star in hours, minutes and seconds of right ascension, and in degrees, minutes and seconds of declination. It will be evident that when the tube is pointed to a star in any part of the visible heavens, a revolution of the polar axis from east to west, in sidereal time, will make the telescope follow the apparent motion of the star. A driving clock, which is usually located inside the column of the instrument, controls the revolutions of the polar axis so that the star observed remains steadily in the field of vision. The equatorial principle has been applied to photographic telescopes in such manner as to allow the continuous exposure of the photographic plate during the entire night, if desired. One of the most ingenious forms of mounting is the Equatorial Coudé. In this instrument the polar axis is enlarged so as to serve as the main tube of the telescope, the eye-piece being at the upper end where the observer can sit comfortably in his warm room and observe any star in the visible heavens as easily as he uses his microscope.

An elbow is rigidly attached to the lower end of the tube. At the intersection is an accurately polished mirror set at an angle of 45 degrees. At the outer end of the elbow is another mirror, similarly set. The objective is so placed that the light it gathers from the star is reflected by the mirrors through the tube to the eye-piece. The combined movements of the polar axis (the telescope tube) and the objective and mirror carried on the elbow, enable the observer to bring into view any star in the visible heavens. The polar axis, with its elbow carrying the objective and revolving in sidereal time by means of a driving clock, follows the apparent motion of the star in the usual way. Two of these instruments are in successful use in the Paris Observatory.

It will be evident that the equatorial telescope with its various modifications as above described, while giving facilities for examining and photographing the heavenly bodies, does not enable the astronomer to determine with required accuracy the positions of the stars and planets. These fine measurements are secured only by special forms of telescopes. The Meridian Circle is one of the most approved instruments for this purpose. From the middle of the tube trunnions extend on either side, carrying finely graduated circles and terminating in accurately ground pivots which are exactly at right angles to the optical axis of the tube. Two piers are so set as to form a rigid and ac-

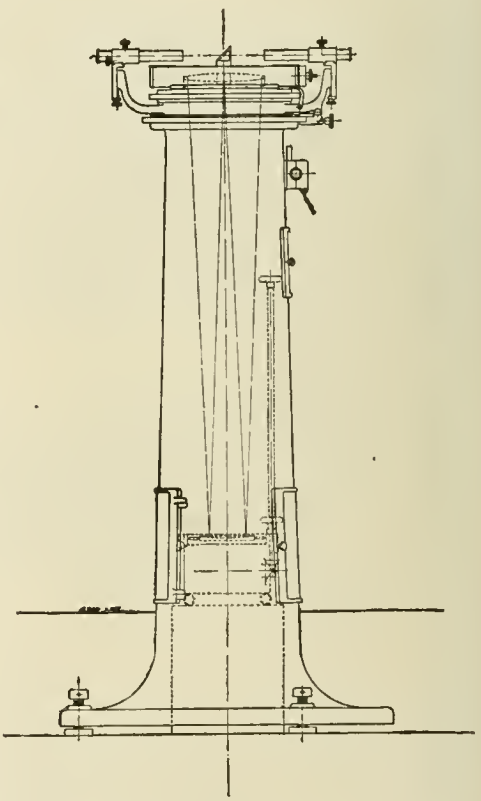
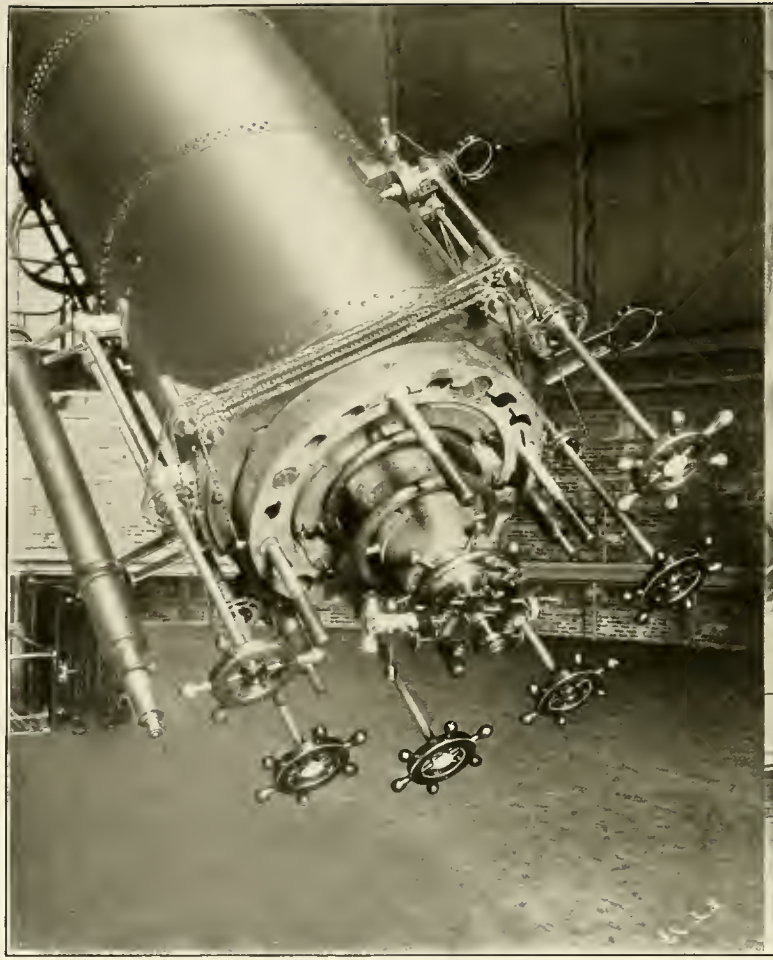
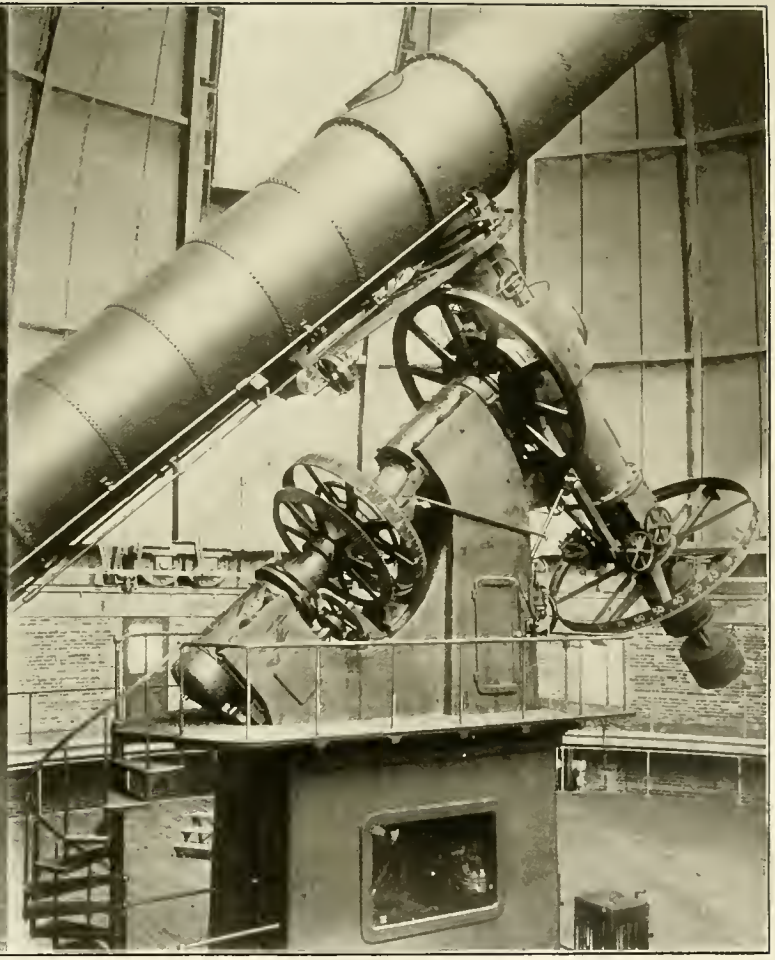


FIG. 7.— Reflex Zenith telescope.

curate support for these pivots, east and west, carrying the tube so that the movement of the telescope is in the true meridian only. In the exact focus of the telescope a fixed system of wires is placed. The best materials for this purpose are taken from the cocoon of the field spider, the web being but



EYE END OF YERKES TELESCOPE.



MOUNTING OF YERKES TELESCOPE.

$\frac{1}{5000}$ of an inch in diameter. These vertical spider webs are equally spaced and so adjusted that the central wire is exactly in the optical axis of the telescope as measured east and west. A horizontal wire is adjusted exactly in the optical axis as measured north and south. Parallel to these central wires there are two movable wires, one horizontal and one vertical, each governed by a micrometer screw.

In measuring transits of stars for determining right ascension, or for time, the telescope, by means of the graduated circles, is set to the declination of the star required, and when the star appears, its transit across each of the wires is recorded on a chronograph, by the observer tapping an electric key. In determining declinations, the telescope, by means of the graduated circles, is set to the approximate declination of the star to be observed, and when the star appears at the edge of the field, the observer carefully adjusts the telescope until the star seems to be exactly bisected by the horizontal wire as it threads its way across the field. By reading the fine circle the declination of the star is obtained. Other types of telescopes for similar observations are known as transits, zenith telescopes, mural circles, etc., but the illustrations given will suffice.

Even with all the caution used in the construction of these delicate instruments, errors are sure to develop, due to refraction, flexure of the tube, variation resulting from changes in temperature and other contributing causes, for all of which allowance must be made in the final reduction of the observations. About the middle of the last century Prof. Airy, then Astronomer Royal at Greenwich, designed and constructed a vertical telescope, which he believed would eliminate the errors so manifest in his other instruments. He named it the "Reflex Zenith Tube.". The principle is shown in Fig. 7. Every part of the instrument is stationary and no part need be touched when in use by the astronomer. The light from the star as it passes the zenith is concentrated by the objective upon a surface of mercury in the base of the column, by which it is reflected back through a hole in the objective; the cone of rays then meets a diagonal prism, is reflected at right angles and enters the eye-piece to be observed as in other instruments. Contrary to the expectations of the Astronomer Royal, errors in the observed position of the stars were still manifest and the most careful investigations failed to trace them to their source. The instrument was therefore discarded. Fifty years later, Prof. Chandler, of Cambridge, Mass., discovered that the pole of the earth "wobbles" slightly, causing a variation in latitude. The results of his observations were compared with the Airy observations of a half century before, and the supposed errors of the "Reflex Zenith Tube" were at once traced to the variation in latitude. The old instrument which had been condemned is thus proven to be correct both in theory and practice. It therefore represents the latest development in astronomical telescopes, and a large Reflex Zenith Tube is now in process of construction for the University of Pennsylvania.

In recent years the mounting of great equatorials has passed from the domain of the instrument-maker to that of the engineer, who finds abundant scope for ingenuity and technical expertness in combining very massive construction with very delicate mechanism. At the present time the largest telescopes in the world are owned and made in America, the giant equatorials of the Yerkes and Lick Observatories taking precedence of all others. The following list indicates the equipment of the more important American observatories:

Name of Observatory	Aperture of telescope	Maker of objective	Maker of mounting
Yerkes (University of Chicago)	40 in.	Alvan Clark & Sons	Warner & Swasey
Lick (University of California)	36 in.	Alvan Clark & Sons	Warner & Swasey
United States Naval	26 in.	Alvan Clark & Sons	Warner & Swasey
University of Virginia	26 in.	Alvan Clark & Sons	Warner & Swasey
Lowell (Harvard University)	24 in.	Alvan Clark & Sons	Alvan Clark & Sons
Princeton	23 in.	Alvan Clark & Sons	Alvan Clark & Sons
University of Pennsylvania	20 in.	John A. Brashear	Warner & Swasey
Northwestern University	18½ in.	Alvan Clark & Sons	Alvan Clark & Sons
Carleton College	16 in.	John A. Brashear	Warner & Swasey

Worcester Reed Warner, F.R.A.S.,
Of the Warner & Swasey Co., Cleveland, O.

Telford, tĕl'fŏrd, **Thomas,** Scottish engineer; b. Eskdale, Dumfriesshire, 9 Aug. 1757; d. Westminster 2 Sept. 1834. At 14 he was apprenticed to a mason, and on the expiration of his time worked as a journeyman at that trade, but subsequently removed to Edinburgh, and there applied himself to the study of architecture. In 1782 he went to London, where he was befriended by Sir William Pulteney, through whom he was appointed surveyor of the public works in Shropshire. He now became a civil engineer, and in 1793 was entrusted with the construction of the Ellesmere Canal, to connect the Mersey, Dee, and Severn. In 1803 and 1804 the parliamentary commissioners for making roads and building bridges in the Highlands of Scotland, and also for making the Caledonian Canal, appointed him their engineer. Under the former board 1,200 bridges, two of 150 feet span, were built, and 1,000 miles of new road were made; and under the latter board the Caledonian Canal was constructed. Under other commissioners he built over 30 harbors, some of which, as at Aberdeen and Dundee, are upon an extensive scale. He was also employed in England, superintending the construction of five large bridges over the Severn, of eight canals, and the execution of numerous important works for the metropolis. In 1808 he was employed by the Swedish government to lay out a system of inland navigation through the central parts of Sweden and to form a direct communication by water between the North Sea and the Baltic. He also built the road between Warsaw and Brest-Sitovski in Poland. The greatest monument of his engineering skill is the Menai Suspension bridge, connecting Caernarvonshire with the Island of Anglesea, which was opened on 30 Jan. 1826. In

1828–30 he superintended the drainage of nearly 50,000 acres of the Fen country. He invented the Telford pavement. See ROADS.

Tell, tĕl, **William,** Swiss peasant of Bürglen, near Altorf, celebrated in legend for his resistance to the tyranny of the Austrian governor Gessler. The stories connected with him, with those relating to the origin of the Swiss Confederation, first appear in the 15th century. According to them, Gessler, the tyrannical Austrian bailiff of Uri, one of the forest cantons, pushed his insolence so far as to require the Swiss to uncover their heads before his hat (as an emblem of the Austrian sovereignty), and condemned Tell, who refused to comply with this mandate, to shoot an apple from the head of his own son. Tell was successful in his attempt, but confessed that a second arrow, which he bore about his person, was intended, in case he had failed, for the punishment of the tyrant, and was therefore retained prisoner. While he was crossing the Lake of the Four Cantons, or Lake of Lucerne, in the same boat with Gessler, a violent storm threatened the destruction of the skiff. Tell, as the most vigorous and skilful helmsman, was set free, and he conducted the boat successfully near the shore, but seized the opportunity to spring upon a rock, pushing off the bark. He had fortunately taken his bow with him, and when the governor finally escaped the storm, and reached a rocky defile on the road to Küssnacht, Tell shot him dead. The death of Gessler was the signal for a most obstinate war between the Swiss and Austrians, which was not brought to a close until 1499. Tell was present at the battle of Morgarten, and is supposed to have lost his life in an inundation in 1350 while attempting to save a friend. Such is the legendary story of William Tell. Investigation has broken down the proofs of his existence. There is no mention of him by any contemporaneous historian; his name is first met with in the chronicles of the second half of the 15th century, and none of the Tell ballads are of an earlier date. Similar stories in regard to the shooting of the apple occur in Saxo Grammaticus, the Danish historian, and in Icelandic literature, not to mention the old English ballad of Adam Bel, Clym of the Cloughe and Wyllyam of Cloudeslè. Besides, the many contradictions between the various personages, dates, and places, and the widely differing representations of the event, show the gradual development of the legend. The untiring industry of historical scholars has not been rewarded by the finding of the name of Tell in the archives and church registers of Uri, and although an uninterrupted series of charters exists relative to the bailiffs or governors of Küssnacht in the 14th century, there is no Gessler among them. The Tell chapels were erected or called by his name generations after his death; the document which speaks of the assemblage in 1388 of 114 persons who knew him personally, and of the erection at that time of a Tell chapel on the shore of the Lake of Lucerne, was not known until 1750. Consult Hisely's 'Recherches Critiques' (1843); Rochholz's 'Tell und Gessler in Sage und Geschichte' (1877); Gisler's 'Die Tellfrage: Versuch ihrer Geschichte und Lösung' (1895). See SWITZERLAND (*History*).

Teller, tĕl'ẽr, **Henry Moore,** American senator: b. Granger, Allegany County, N. Y., 23 May 1830. He was educated at Alfred University, New York; taught school; and after admission to the bar practised law in Illinois and Colorado. He was United States Senator from Colorado 1876–82, secretary of the interior 1882–5, and has been a member of the national senate since 1885, except for a brief interval 1896–7. He has been especially prominent as a silver advocate.

Tellicherry, tĕl-ĭ-chĕr'ĭ, or **Tellicherri,** India, a seaport and garrison town in the Malabar district of Madras, 45 miles northwest of Calicut. The main buildings include the castle — now a jail — the north Malabar district court, custom-house, churches, and government offices. The entire area, on a picturesque site, covers about five square miles. The principal exports are sandal wood, coffee, and cardamoms, spices, cocoa and cocoanuts. The factory of the East India Company was founded in 1683. There are missions and other schools; also Brennan College. Pop. 27,200.

Tellu'rium, an element discovered by Mueller von Reichenstein (1782) in a specimen of gold ore from Austria. Klaproth named it from the Latin *tellus,* meaning the earth. Tellurium occurs free, but most commonly in company with gold, silver, lead and bismuth. Native tellurium is found in considerable quantity in Boulder County, Colorado. The other important minerals containing tellurium are sylvanite, calaverite, pelzite, hessite, and tetradymite. They are found principally in Austria, and in the United States in Colorado and adjacent States.

Tellurium is a silver white metal, atomic weight 127.6, melting point about 453° C. and specific gravity 6.25. It is brittle, not changed by exposure to the air, when heated a little above its melting point, it boils and condenses again in the cool portion of the retort as metallic drops. In chemical properties it is very like sulphur. It unites with chlorine readily forming $TeCl_2$ and $TeCl_4$. The oxides TeO_2 and TeO_3 are analogous, yet differ considerably from SO_2 and SO_3. Tellurious and telluric acids and the salts derived from them are also known. Tellurium forms a compound with hydrogen analogous to H_2S and possessing an even more disagreeable odor.

This element resembles sulphur in imparting very undesirable properties to metals even when present in very small amount. If tellurium and any of its compounds are introduced into the human system they give the breath a very strong and disagreeable garlic-like odor. To obtain the free element the ore is digested first with sulphuric acid; hydrochloric acid is then added in small quantity and the whole treated with sulphurous acid which precipitates the tellurium.

Telpherage. Both the system and the word "telpherage," which means "distance carrying," were introduced by the late Fleeming Jenkin. He recognized the ease with which the electric motor could be adapted to automatic transportation of materials and he devised a system which when put into service gave satisfaction. This consisted of two overhead cables, mounted on stout poles, along which light carriers were hauled by means of one or more electric motors. To transmit current to the motors the cables were cut into sections, adjacent sections of one cable being insulated from each other, but cross-converted with sections of the other cable so as to form two continuous conductors, each lying alternately on the right and on the left of the

system. The trains were somewhat longer than the sections of cable so that one end rested on one conductor while the other was on the second, thus completing the electric circuit.

Modern telpherage systems are more elaborate than Jenkins'. The current is transmitted to the motors by means of a small trolley wire erected over the running cable or rail. Sometimes a double trolley system is adopted. The telpher or towing vehicle is usually equipped with two motors. These may be placed on opposite sides of the cable or side by side. The driving wheels are mounted directly on the motor shafts, as gearings are not used. The carrier way is attached to the telpher or to a trailer and is often fitted with a third motor for hoisting the load. When heavy loads are to be carried two supports may be used, each having one or more running wheels. When the system is not automatic it is controlled from one station or an operator is carried with the train.

Where heavy weights are to be transported the cable is supported between the posts by a suspension cable, or a rail takes the place of the cable. In any case a rail is used when a corner is to be turned and in running through buildings where the cable construction would be difficult.

The advantages claimed for the telpherage system are economy in cost of transporting and a capacity for moving large quantities of material with a low cost of construction as compared with a railway. Further, the system may be erected overhead and out of the way. Telpherage systems are now used in industrial works of all kinds for carrying materials in a building as well as outside. The system may also be adapted to other work, such as excavating trenches, canal construction, etc. See 'Telpherage,' by Chas. M. Clark; 'Transactions American Institute Electrical Engineers,' Vol. XIX., p. 391.

W. Hand Brown, Jr.,
Editor 'Electrical Review.'

Telugu, tĕl'oo-goo, or **Telin'ga,** a language of India, belonging to the Dravidian group, and spoken by about twenty millions of people in Madras, Hyderabad, Mysore, Bombay, Central Provinces, Burma, Berar, and other parts. The Telugu are the most numerous branch of the Dravidian race, but are less enterprising than the Tamils, who occupy the country to the south of them. The language is allied in roots to the Tamil language, but differs considerably otherwise. See India; Tamils.

Tembuland, tĕm'boo-lănd, South Africa, a district or dependency of the Cape Colony, in the east of which it is situated, one of the Transkei districts, adjoining Pondoland and Griqualand East; chief town Umtata. Pop. 180,415 (5,179 Europeans).

Tem'enos, anciently a sacred plot of ground; a piece of land marked off and consecrated to God. Any tract of land allotted to a temple or sanctuary.

Temesvar, tĕm'ĕsh-vär, Hungary, on the Bega Canal, 75 miles northeast of Belgrade. It comprises a citadel and suburbs — four in number. Noteworthy are the castle, cathedral, synagogue, bishop's residence, and town-house. The manufactures include woolen goods, oil, paper, tobacco, leather, etc., and there are grain-mills, distilleries, etc. The fortress has sustained many sieges; memorable is that of 1849, when it was invested and bombarded by the insurgents. Pop. (1900) 53,033.

Tempe, tĕm'pē, **Vale of,** Greece, in Thessaly, a beautiful valley on the Peneus, flanked by Olympus at the north and Mount Ossa at the south. It has been immortalized by the classical poets.

Tempera, in painting. See Distemper.

Temperament. See Reed, Flue, and Stringed Instruments, Care of.

Temperance, in the early stage of the movement to mitigate the evils arising from the use of intoxicating drinks, meant as the etymological meaning of the word implies, the observance of moderation in their use, when the aim was only to prevent drunkenness by appeals to the drinker. Among its more strenuous advocates it now commonly signifies total abstinence from such liquors.

There have been, indeed, in every age, some persons who practised and advocated abstinence, some also who proposed laws prohibiting wholly or in part the sale of intoxicating beverages; but such persons were few and far between among white peoples previous to the beginning of the 19th century.

Ancient Civilizations.— Descriptions of the evils wrought by drunkenness and efforts to cure them are as old as literature. On the tombs of Beni-Hassan in Egypt, 5,000 years old, pictures are seen of drunken men carried home by their slaves after a feast, and of women also who are manifestly intoxicated. Wine was offered to the gods in connection with rites of the most bestial character. There was at least one advocate of abstinence, one prohibitionist in Egypt, in 2000 B.C., Amen-em-an, a priest, who is on record, in a letter to a pupil, as commending his pledge of total abstinence, taken with an oath, and insisting on its observance: "I, thy superior, forbid thee to go to the taverns. Thou art degraded like the beasts. God regards not the breakers of pledges." Chinese literature of the same period furnishes like utterances. In 2285 the emperor banished a man for inventing an intoxicant made from rice. Mencius declares that Yao the Great was an abstainer, and that during his reign virtue pervaded the land, and crime was unknown. A few years later, 2187 B.C., a drunken ruler led the people to drunkenness, which continued and increased for centuries. The anti-treating remedy was tried 202 B.C. in a law forbidding drinking in companies of more than three. This was unavailing and so in 98 B.C. government ownership was tried, also without satisfaction. In 459 B.C. China adopted prohibition, with beheading as the penalty for liquor selling, and this policy has been generally followed in China since then. Whether because of this law or because of racial and climatic conditions or perhaps through all of these causes, missionaries and travelers at the opening of the 20th century reported so little drunkenness in China that special temperance efforts were unnecessary except in ports where European and American beer has been introduced. President James B. Angell, former American minister to China, declared in 1900 that while at Peking he did not see two drunken Chinese a year. The opium, which may seem to some a substitute, was seldom used except as a medicine until in-

troduced by Europeans shortly before the Opium war of 1840. Japan, kindred to China, has a similar story of unusual freedom from the curse of drink, to which her statesmen have added successful prohibition of opium except as a prescription medicine, and of tobacco for all under 20 years of age — for all students in public institutions of any age. Japanese saki is the root of many a sad story of drunkenness, and at the close of the 19th century American beer halls became a popular novelty, prompting another novelty for the Japanese, temperance societies; but drunkenness has never been common in Japan. In India the gods of early times were shrewdly represented by the priests as very fond of intoxicants, and the people learned to drink with their gods in their temples until drunkenness became so serious a social peril that both the Hindu and Buddhist religions required total abstinence by a rule that in the union of church and state was both a religious precept and a civil law. Mohammed's prohibitory law (Koran v 7), prompted by drunkenness in Arabia, has spread abstinence among millions in both Asia and Africa. These three total abstinence religions, reinforced perhaps by the natural influence of tropical climate, produced such results that at the opening of the 19th century there was very little drunkenness among the tinted races, and the temperance problem among these races is largely how to save them from new drinking habits prompted by the white man's example and the white man's liquor traffic. Seventeen great nations have adopted two treaties to protect natives of Africa against distilled liquors, to which the United States government has asked that a final world treaty be added to prohibit the sale of all intoxicants and opium among all the uncivilized races of the world. See Opium Traffic.

Modern Christian Nations.— Among the white races in the "Christian nations," we find that intemperance has wrought greater havoc and has yielded less readily to remedies applied, which until recently have not been, as in the Orient, total abstinence and prohibition, applied in the name of religion and backed by civil power, but moderation offered without the imperatives of either religion or civil government. The Bible's teaching on this subject is not so clear as to be beyond controversy. In one passage it seems to proclaim total abstinence in the strongest terms (Prov. xxiii. 31), but there are other passages where wine is spoken of with favor. One class of commentators hold that wherever wine is spoken of in the Bible favorably the reference is to unfermented wine, but other commentators insist that this is not proven and declare that the Bible goes no farther than condemnation of drunkenness and exhortation to moderation. This was the generally accepted interpretation up to the 19th century, before which preachers usually condemned only the "abuse" of distilled liquors.

Greece and Rome were founded on "a basis of hostility, sentimental and legal, to the use of intoxicating liquors," and were strongest while they held to that attitude. Plato taught that men should not drink wine at all until 30 years of age, and but sparingly from 30 to 40, when they might indulge increasingly to old age. Demosthenes was a total abstainer. Most of the Greek worthies uttered warnings against wine. But this early virtue was relaxed for the worship of Bacchus, and with it came political decay and subjection to Rome, which had adopted the earlier temperance code of Greece. Romulus is reputed to have been a most radical prohibitionist. A husband was authorized to kill his wife for drinking wine or committing adultery, and men were forbidden to drink wine before 30 years of age — this law doubtless borrowed from Greece. Libations to the gods were in that age in milk. In 319 we first hear of a libation promised to Jupiter of a "small cup of wine." The worshipper could not be expected to be more temperate than his god. And so with other arts of Greece its wines and worship of Bacchus were adopted, and wines came to be used increasingly. The end of the republic is synchronous with the beginning of drunkenness. By Pliny's time the drunkenness of men and women had become notorious. Drinking wagers were the entertainment of feasts. One man was knighted as Tricongius, the three-gallon knight, for putting away that much wine at one time, and another was "celebrated" for drinking twice as much. With Bacchus came Venus, and so Rome went down the three steps to the grave of nations: moral, physical, political decay. Up to this time distilled liquors were unknown. The drunkenness thus far described was upon wine.

Ancient European Tribes.— Among the rugged German tribes and the Britons drinking was common, but less excessive, and they were better able to bear it. They drank a sort of beer prepared from barley and wheat, sometimes using the skulls of their enemies for their cups. Quarrels often arose, ending in bloodshed. Drinking was encouraged by the theory that in drink men were most sincere, throwing off disguise, and also most open to deeds of heroism. Drinking, however, was by no means so general among these tribes of Germany and Britain as among the Romans. Queen Boadicea, addressing her soldiers, 61 A.D., after condemning the intemperance of her foes, said: "To us every herb and root are food, every juice our oil, and water is our wine." But the Romans brought in the art of wine-making, which led the native Britons to such increased drunkenness that the Emperor Domitian ordered half the vineyards cut down.

Great Britain.— In the Roman period we find the "public house" or "tavern" developing, where drink, with games, was the centre of social converse, not alone for travelers, but for people of the vicinage also, especially in Britain. The Roman emperors from 81 A.D. to 276 A.D. made some efforts to counteract the increase of drunkenness in Britain, which the introduction of wine-making had caused, but in the last-named year the restriction of vineyards gave place to imperial permission for unrestricted production and drinking of wine. The public houses became such centres of drunkenness that they were put in charge of clergymen, the first appearance of the theory that liquors would be harmless if sold by "persons of a good moral character." But for this or other reasons or both the drunkenness of priests increased, and they were warned by their superiors to keep away from alehouses and taverns. In 569 A.D. a church decree, said to be the only decree of the British State Church on intemperance, im-

posed a "penance for three days" on priests who got drunk when about to go on duty at the altar. The decree also imposed penance for 15 days on those who got drunk "through ignorance," for 40 days in case it was "through negligence," for three quarantines if "through contempt." One who "forced another to get drunk through hospitality" was to be punished as if drunk himself, and one who got another drunk out of "hatred" or in order to "mock" him was to "do penance as a murderer of souls." Notwithstanding all this penance, drunkenness increased — every wedding, funeral and holiday being an excuse for excess, culminating in "the twelve merry days" of what came to be called, because of its debauchery, "anti-Christmas." In the 7th century the public house became the rendezvous of the Anglo-Saxon "guilds," a word meaning that each paid his share, in which men of the same trade, masters and men, met together to talk and drink. The Danish invasion reinforced drinking habits, for the Danes had been accustomed to drink to the gods. The Norman invasion still further reinforced drinking by introducing French and Spanish wines. Vineyards were generally attached to religious houses. Drunken revels of the nobility are often mentioned in writings of this period. In the 13th century temperance reform consisted of efforts to substitute light wines for beer and ale. In the next century the reverse policy came into favor, and "church ales" filled the place now occupied by strawberry festivals in raising religious funds. Two hundred years after, these "church ales" were denounced by church leaders, but the national drink was too strongly intrenched to be dislodged from popular favor by banishment from ecclesiastical finance.

Restrictive Legislation.— Late in the 15th century Henry VII. of England began the license system in efforts to secure at once restriction and revenue. Henry VIII. added to these laws, and attempted to prevent adulteration. It was in his time that the custom of transacting business over drink originated. In his time also distilled liquors, then called "ardent spirits," were introduced into England from Ireland. During Elizabeth's reign added restrictive legislation attested the insufficiency of what had preceded and the increase of drunkenness. Liquor selling became a crown monopoly, let out for fee or favor. Home consumption was discouraged, but exportation was promoted, and the queen herself exported liquors for profit. In this Elizabethan era the modern "club" began, in which men of high social standing were brought together for political or literary conversation, with drinking as a feature. In the reign of the Stuarts and Hanovers the ale house came to be "the poor man's club." Restrictive liquor laws multiplied from reign to reign until in three centuries from the beginning of the 15th century there were as many as the years. But drinking and drunkenness increased. The average of British spirits distilled rose from 527,000 in 1684 to 3,601,000 in 1727 — this besides all the malt and vinous liquors. Retailers of gin put out signs that customers could get "drunk for a penny, dead drunk for two pence, and have straw for nothing." High license for gin was tried for a temperance measure in 1736. The protests against this law and the support of it by good men constitute the first real temperance agitation in Great Britain. From that time there have been frequent efforts to restrict, and constant pleas for moderation, and more recently for total abstinence and prohibition. About all the prohibition secured in Great Britain has been for Sundays, on which day liquor selling is forbidden, except to bona fide travelers, in Scotland, Ireland (except five cities), and in Wales, but not yet in England, though strongly demanded. Legal efforts in Great Britain are chiefly devoted to securing "local control," corresponding to "local option" in the United States. Movements for total abstinence, which were given great impetus by Father Matthew and John B. Gough and have been fostered by numerous "teetotal" organizations, have been in Great Britain more successful than legislative temperance work. An increasing minority of the clergy in the State Church and the Roman Catholic Church are abstainers, and an increasing majority in the non-conformist churches, but an effort in 1903 to exclude liquor sellers from Wesleyan lay offices was unsuccessful.

British Colonies, however, outrank all other commonwealths in temperance reform, Canada showing a consumption of less than five gallons per capita, Australia about 15, which are respectively about one fourth and three fourths of the consumption in the United States, which has the smallest liquor consumption and the largest area of prohibition of any Christian nation when the white population of the entire jurisdiction in each case is brought into the comparison.

United States.— The first settlers in the American colonies brought with them the European usages in drinking, and down to the 19th century liquors were a part of the usual entertainment at the American ordination of a preacher, or dedication of a church. Elders manufactured, and deacons sold these liquors. Increasing drunkenness only prompted appeals for moderation and more restrictive laws.

The Modern Temperance Reformation is generally traced to the protest against the use of distilled liquors made by Dr. Benjamin Rush, a physician of Philadelphia, in 1785. He persuaded his associates of the Philadelphia College of Physicians that the habitual use of distilled spirits was unnecessary and they united in an appeal to Congress in 1790 to "impose such heavy duties upon all distilled spirits as shall be effective to restrain their intemperate use in the country." One year previous, in Litchfield, Conn., the first society pledged to abstain from distilled spirits was formed. No other known society down to 1826 did more than "discountenance the too free use of ardent spirits." Dr. Rush in 1811 persuaded the Presbyterian General Assembly to appoint a committee to act with others in devising remedies for drunkenness, which was confessed to have seriously invaded the churches. (In 1784 both the Methodists and the Quakers had enjoined their members not to sell or use "spirituous liquors.") In 1812 Dr. Lyman Beecher preached a series of temperance sermons which gave a great impetus to the new reform. In 1826 temperance societies generally pledged their members not to moderation, but to abstinence from distilled spirits. All except a few radicals regarded beer and wine as temperance drinks until in 1836, at the second Na-

tional Temperance Convention, composed of delegates from temperance societies and churches, after a full discussion, it was resolved that the only effective basis for temperance work was total abstinence from all drinks that can intoxicate, including beer and wine and all fermented as well as distilled liquors. On that platform was organized the American Temperance Union, the first national total abstinence society. The "Washingtonian Movement," which began in Baltimore in 1840, reinforced by the eloquence of John B. Gough in 1842, led many thousands of hard drinkers to take the pledge, who with others were organized in fraternal societies. The Sons of Temperance were organized in 1842. The Rechabites were introduced from England the same year. The Good Samaritans started in 1847, but have declined since the War. The Good Templars organized in 1857. Temperance societies, in the decade beginning 1850, had generally reached the conclusion that the best legal remedy for the evils of drink was Prohibition (q.v.). The movement toward that standard was checked by the War, which, with the introduction of German lager in popular saloons, that afforded social fellowship and amusement and music, increased drinking, and when the War was over pledge-signing movements were renewed, especially the "ribbon clubs," in which all who took the pledge "showed their colors" in red or blue. In 1872 came the woman's temperance crusade, in which refined women went in companies to saloons with prayer and song, urging the proprietors to give up the business. Out of this grew the greatest of temperance organizations which now has branches in almost every American city and in nearly all foreign lands, the Woman's Christian Temperance Union, whose most influential leader was Frances E. Willard. Its first work was mostly to reform drunkards. Later it dealt more with prevention, especially child training and prohibition. The organization finding other vices associated with drink, broadened to include "forty departments" of reform work, aiming to right all the social relations of men to each other. In 1865 the National Temperance Society and Publishing House succeeded to the American Temperance Union. The new society was largely devoted to furnishing prohibition literature. The decade from 1880 to 1890 was characterized by efforts to secure State constitutional prohibition in many States, and although only a few of these campaigns succeeded, the total vote for prohibition was 49 per cent of all the votes cast. Another important legislative movement was that by which in 30 years preceding 1902 scientific temperance education under the lead of Mrs. Mary H. Hunt, of the W.C. T. U., was made compulsory in all the schools of the Republic. The radical temperance men organized a "Prohibition Party" in 1872, the vote of which had grown in 1900 to 209,936. In 1895, railroads having generally begun to require total abstinence of employees, and many other business houses having adopted that policy, Congress ordered an investigation in all lines of business of "The Economic Aspects of the Liquor Question," the summary of which was: "More than half of the establishments reporting require in certain occupations and under certain circumstances that employees shall not use intoxicating liquors." In 1899 Congress passed the first national prohibition law for white men, prohibiting the sale of even beer and light wines in army "canteens," which law was re-affirmed in two years, and in 1903 was followed by laws excluding liquor from United States immigrant stations and the Capitol, in further development of the policy of prohibiting liquor selling in government buildings. Then national temperance efforts turned to preventing interference with State liquor laws by outsiders under protection of national powers of "interstate commerce" and "internal revenue," in order to give free scope to the growing policy of local prohibition which, with other forms of prohibition, was reported in 1904 to have extended to two fifths of the population.

WILBUR F. CRAFTS,
International Reform Bureau.

Temperance Societies. See TEMPERANCE.

Temperance, Sons of, or The Order of the Sons of Temperance, was organized in the city of New York, 29 Sept. 1842. It is composed of subordinate, grand, and national divisions. It has four national divisions — one for North America, one for Great Britain and Ireland, and two for Australia. In the course of its existence it has had nearly 4,000,000 members on its rolls. Its present membership in North America is 45,071, of whom 17,468 are in the United States. Its fundamental principle is total abstinence from all intoxicating liquors.

Temperature. See HEAT; THERMOMETER; THERMOMETRY; THERMODYNAMICS; ZERO.

Temperature of the Body. See ANIMAL HEAT.

Temperature Varieties. See VARIATION.

Tempering, the art of imparting to metals, by means of heat treatment, a definite degree of hardness. The term is now applied almost exclusively to certain kinds of steel, which are used in the manufacture of tools. It is said that the ancients could harden and temper copper; but this art, if it ever really existed, is now lost. The effects of thermal changes upon steel vary greatly with the quality of the steel, and with the exact nature of the treatment. It is necessary to distinguish clearly between "annealing," "hardening," and "tempering." Any steel may be annealed, but it is essential that the steel shall contain a certain amount of carbon, in order that it may be capable of being hardened and tempered. If steel is raised to a red heat and is then allowed to cool very slowly, it becomes relatively soft, so that it can be filed and turned in a lathe. This process is called "annealing," and it has usually been held that the slowness of the cooling is the essential thing in the softening process. There is excellent reason for believing, however, that the exact temperature to which the steel is exposed before it is cooled has a much greater influence than the rapidity of the cooling. It has been shown, for example, by the researches of Brinell, Tschernoff, Le Chatelier, Heyn, Ridsdale, Stead, and others, that steel which has acquired a dangerously crystalline character from annealing for a long time at too low a temperature in a slightly oxidizing atmosphere, or from long continued heating at high temperatures, may have its original structure and properties restored by the simple artifice of heating it to a certain critical temperature (which is about 1,600° F.), and then allowing it

to cool; the rate of cooling, in this case, being a matter of comparative unimportance. Steels may sometimes be had which do not need special treatment to render them fit for use in certain classes of tools; the tool being ready for use after it has been forged and allowed to cool by natural exposure to the air. In general, however, a tool steel must receive special treatment in order to fit it for the work in hand; this treatment being given after the tool has been forged to shape. The process of tempering then consists of two steps, the first of which consists in imparting to the cutting edge of the tool a degree of hardness that is too great for the work for which the tool is to be used, while the second step consists in reducing (or "tempering") this hardness, until it attains a value that experience has shown to be satisfactory. The tempering of an ordinary tool may be described as follows: The finished tool is heated to a bright red, care being taken to have the heat extend back to some distance from the cutting edge. The cutting edge of the tool is then immersed in water to a slight depth, and kept there until it has cooled sufficiently to remain wet when withdrawn from the water. By this means the steel is rendered exceedingly hard throughout the chilled part; that is, in the vicinity of the cutting edge. If it were used in this condition, however, the edge would be too brittle, and would be likely to break in service. To reduce the hardness to the proper value, the tool, immediately after being withdrawn from the water, is brightened up near the cutting edge with a piece of emery cloth, or in some similar manner, and the cleaned area is then watched while the heat from the unquenched part spreads toward the cutting edge. The oxidization of the steel, as the edge becomes hotter and hotter from conduction, causes a play of color to become visible, which serves as an index of the temperature. These colors run from the hot portion of the tool toward the quenched cutting edge. In the order in which they proceed, they may be described as pale yellow, straw yellow, brownish yellow, light purple, dark purple, and blue. When the proper color reaches the cutting edge, the whole piece is again quenched, and the "tempering" is complete. The colors that are used for different implements are as indicated below:

Very pale yellow (about 430° F.): Steel-engraving tools, turning tools, hammer faces, planer tools, wood-engraving tools.

Straw yellow (about 460° F.): Dies, taps, drills, punches, reamers.

Brown yellow (about 500° F.): Gouges, plane irons, twist drills, cooper tools, wood-boring cutters.

Light purple (about 530° F.): Augers, surgical instruments, cold chisels, edging cutters.

Dark purple (about 550° F.): Axes, gimlets, needles, hack-saws, screwdrivers, springs, wood saws.

Some tools are of such a shape that they cannot be tempered in the manner here described, but must have their temper "drawn" to the desired color by re-heating the piece between hot iron plates, or in a hot iron ring. Springs are often tempered by a different method, known as "oil tempering." In carrying out this method, the piece is first hardened by heating to a bright red heat and then quenching by plunging the whole piece in water or in oil. The article to be tempered is then wetted with sperm oil, and gradually and uniformly heated until the oil upon it blazes up, when the piece is again quenched in the oil. This process of heating to the ignition point of the oil and then quenching is repeated until it has been performed three times, after which the piece is said to be "oil tempered," and is ready for use.

In the early days of steel-working in the United States, it was common to import water in casks from Sheffield, England, for hardening and tempering purposes, as it was believed that there is some special virtue in the water that had been used for so long, and with such eminent success, in that city. There was probably little or no foundation for this belief, and yet it is known that substances that may be in solution in the water that is used for quenching often have an important influence upon the product. Many artisans dissolve salt or cyanide of potassium in the water that they use for this purpose, and there is considerable ground for the belief that such dissolved substances do exert an influence upon the character of the product, which is out of all apparent proportion to the strength of the solutions containing them. In particular, it may be noted that there is a deeply-rooted belief among blacksmiths and other artisans who work with metals, that a piece of steel cannot be hardened by heating it and then quenching it in water that contains soap, even in small amounts.

A. D. Risteen, Ph.D.,
Editorial Staff 'Encyclopedia Americana.'

Tempest, The, a play by Shakespeare, performed at court in 1611 and first printed in 1623. It was based on a pamphlet entitled 'A Discovery of the Bermudas, otherwise called the Isle of Devils,' by one Jourdan who is supposed to have returned from Virginia in 1610. Fleay conjectures that the play was abridged by Beaumont about 1613 and the masque interpolated. A version of the play by Dryden and Davenant, 'The Tempest or the Enchanted Island,' was put forth in 1670. Shadwell made it the libretto of an opera in 1673, and Garrick in 1756 produced an opera similarly named, which he based on Shakespeare and Dryden. In 1862 Sir Arthur Sullivan composed 'The Music to Shakespeare's Tempest' in 12 numbers.

Templar, Knights. See Masonic Fraternity, The.

Tem'ple, Frederick, English prelate, archbishop of Canterbury: b. Santa Maura, Ionian Islands, 30 Nov. 1821; d. London 23 Dec. 1902. He was the son of an English army officer who died while he was a child, and under his mother's care was well educated in youth, so that he obtained a "double first" at Oxford and was elected fellow and tutor of his college. After his ordination in 1846 he took charge of Kneller Hall, Twickenham, and from 1848 to 1858 was school inspector. In the latter year he was made headmaster of Rugby and became one of the most powerful and influential successors of Arnold. The publication of 'Essays and Reviews,' in which series Temple led off with 'The Education of the World,' roused a storm of acrimonious controversy, but did not shake confidence in the headmaster of Rugby, who was appointed bishop of Exeter in 1860, was translated to London in 1885 and succeeded Archbishop Benson in 1896. Equally as schoolmaster and as bishop he was a

strict disciplinarian, an untiring worker, a blunt, just and sincere man whose plainness of address did not obscure the massive learning with which his mind was stored. The great controversial storms of the century had spent their fury in the English Church before he reached the primacy, but his incumbency was not uneventful. The Tractarian movement was in its last phase of ritualism, and Temple handled ritualists with firmness and moderation. He took part in the Queen's diamond jubilee (1897) and placed the crown on the head of her successor. His only writings are 'Sermons in Rugby Chapel' and Bampton Lectures for 1884 on 'The Relations between Religion and Science,' of which it may be said that they were up to the standard set by previous lecturers and were not unworthy of the future Primate of All England. He died in harness, never recovering from the effort he made in a strong appeal in the House of Lords uttered in favor of the public education bill.

Temple, Oliver Perry, American lawyer and author: b. Green County, Tenn., 27 Jan. 1820. He was graduated from Washington College, Tenn., in 1844, and admitted to the bar in 1846. He was a Union leader in East Tennessee during the Civil War; was a chancellor of Tennessee, 1866–78, and retired from the bar in 1881. His publications include 'The Covenanter,' 'The Cavalier and the Puritan' (1897); 'Union Leaders of East Tennessee' (1903), etc.

Temple, Richard Carnac, English civil servant and antiquary: b. Allahabad, India, 15 Oct. 1850. He was educated at Cambridge University. He served in the Burma war 1887–9 and received a medal for bravery. From 1887–93 he was engaged by the Indian government to raise and fit out volunteer regiments. He has published 'Wide Awake Stories' (1884); 'Legends of the Panjab' (1883–90); etc., and is a member of philological and other learned societies.

Temple, Sir William, English statesman: b. London 1628; d. Moor Park, Surrey, 27 Jan. 1699. He was educated at Cambridge, spent six years on the Continent and returning in 1654, and not choosing to accept any office under Cromwell, occupied himself in the study of history and philosophy. On the Restoration he was chosen a member of the Irish convention, and in 1661 was returned for the county of Carlow. The following year he was nominated one of the commissioners from the Irish Parliament to the king, and removed to London. On the breaking out of the Dutch war, he was employed in a secret mission to the Bishop of Münster which he executed so much to the satisfaction of the ministers that in the following year he was appointed resident at Brussels, and received a baronetcy. With De Witt he concluded the treaty between England, Holland, and Sweden (February 1668), with a view to oblige France to restore her conquests in the Netherlands. He also attended, as ambassador extraordinary, when peace was concluded between France and Spain at Aix-la-Chapelle, and subsequently residing at the Hague as ambassador, enjoyed the friendship of De Witt, and also of the Prince of Orange, afterward William III. A change of politics led to the recall of Temple in 1669, who, refusing to assist in the intended breach with Holland, retired from public business, and employed himself in writing his 'Observations on the United Provinces,' and part of his 'Miscellanies.' In 1674 Temple was again ambassador to the States-General, in order to negotiate a general pacification. Previously to its termination in the Treaty of Nimeguen (in 1678), he was instrumental in promoting the marriage of the Prince of Orange with Mary, eldest daughter of the Duke of York, which took place in 1677. In 1679 he was recalled from The Hague, and shortly afterward was elected to represent the University of Cambridge in Parliament. In 1681 he retired from public life altogether. He was on friendly terms with William III., who occasionally visited him. His relations with Swift are detailed in the article Swift. His 'Memoirs' are important as regards the history of the times, as are likewise his 'Letters,' published by Swift after his death. His 'Miscellanies' consist of essays on various subjects: 'Gardening,' 'The Cure of the Gout,' 'Ancient and Modern Learning' (which provoked much controversy at the time), 'Health and Long Life,' 'Different Conditions of Life and Fortune,' 'Introduction to the History of England,' 'Poems and Translations,' etc. Courtenay, 'Life of Temple' (1836); Macaulay's 'Essay,' and Forster, 'Life of Swift,' Vol. I. (1875).

Temple, Texas, city in Bell County; on the Gulf, Colorado & Santa Fé and the Missouri, Kansas & Texas R.R.'s; about 220 miles northwest of Galveston and 35 miles southwest of Waco. It was founded in 1882 by the Gulf, Colorado & Santa Fé Railroad, and was chartered as a city the same year. It is in an agricultural and stock-raising region and has considerable manufacturing interests. The chief manufacturing establishments are agricultural-implement works, cottonseed-oil mils, and cotton compresses. The government census of 1900 gives the number of manufacturing establishments, 74; the amount of capital invested, $700,369; the number of employees in the manufacturing establishments, 328; the annual amount of wages, $158,882; the cost of material, $569,580; and the value of the products, $908,726. There are eight churches, public and parish schools, Saint Mary's Academy, two kindergartens, a business college, and a public library. The three banks have a combined capital of $280,000. Pop. (1900) 7,065.

Temple, The, London, England, a district of the city lying between Fleet Street and the Thames, and divided by Middle Temple Lane into the Inner and the Middle Temple, belonging to separate societies (see Inns of Court), each with its hall, library, and gardens. The name is derived from the Knights Templars, who had their headquarters in England here. The two temples are separated by a wall from the rest of the city, and have entrance gates which are closed at night. The district is occupied, with few exceptions, exclusively by barristers and solicitors. In former times the members of the Temple were famous for the masques, revels, and banquets which they gave in their halls. To these entertainments there are many allusions in the old poets; kings attended them, the benchers joined in them, and directed the students to dance. Among famous members of the Temple have been Beaumont, Sir Walter Raleigh, John Ford, Wycherley, Congreve, Cowper, Blackstone, Sheridan, Coke, Littleton, Clarendon, Somers, and Eldon. Goldsmith and Johnson had chambers here, and here Charles Lamb was born, and passed the first seven years of his life.

Temple, a name applied in religious history particularly to the temple built by Solomon at Jerusalem as a House of the Lord, and to the temples which succeeded it, more especially the magnificent structure, erected by Herod the Great, which is often mentioned in the New Testament. Solomon's Temple was built with the aid of an architect and skilled workmen from Phœnicia. The temple was an oblong stone building, 60 cubits in length, 20 in width, and 30 in height. On three sides were corridors, rising above each other to the height of three stories, and containing rooms in which were preserved the holy utensils and treasures. The fourth or front side was open, and was ornamented with a portico, 10 cubits in width, supported by two brazen pillars, Jachin and Boaz (stability and strength). The interior was divided into the most holy place or oracle, 20 cubits long, which contained the ark of the covenant, and was separated by a curtain or veil from the sanctuary or holy place, in which were the golden candlesticks, the table of the shew-bread, and the altar of incense. The walls of both apartments and the roof and ceiling of the most holy place were overlaid with wood work, skilfully carved. None but the high-priest was permitted to enter the latter, and only the priests devoted to the temple service the former. The temple was surrounded by an inner court, which contained the altar of burnt-offering, the brazen sea and lavers, and such instruments and utensils as were used in the sacrifices, which, as well as the prayers, were offered here. Colonnades, with brazen gates, separated this court of the priests from the outer court, which was likewise surrounded by a wall. This temple was destroyed by the Assyrians, and after the return from the Babylonish captivity a second temple of the same form, but much inferior in splendor, was erected. Herod the Great rebuilt it of a larger size, surrounding it with four courts, rising above each other like terraces. The lower court was 500 cubits square, on three sides surrounded by a double, and on the fourth by a triple row of columns, and was called the court of the Gentiles, because individuals of all nations were admitted into it indiscriminately. A high wall separated the court of the women, 135 cubits square, in which the Jewish females assembled to perform their devotions, from the court of the Gentiles. From the court of the women 15 steps led to the court of the temple, which was enclosed by a colonnade, and divided by trellis-work into the court of the Jewish men and the court of the priests. 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, and three galleries like the first temple, which it resembled in the interior, except that the most holy place was empty, and the height of Herod's temple was double the height of Solomon's. Rooms appropriated for different purposes filled the upper story above the roof of the inner temple. This edifice was destroyed by the Romans in 70 A.D., and for many centuries the long-consecrated height has been occupied by the Mosque of Omar.

The Egyptians, Greeks, Romans, Persians, and other ancient nations, had temples for the worship of their gods, and the Mexicans and Peruvians, at the time of the arrival of the Spaniards in the New World, had splendid temples. On the sacrificial platforms of Aztec temples thousands of victims perished annually. The Greek and Roman temples were, as a rule, models of architectural grandeur and beauty. The word "temple" is sometimes, but not often, applied to Christian places of worship as a special designation, although frequently used in a figurative sense. The Mormons designate as "The Temple," the large structure in which they worship at Salt Lake City. See ARCHITECTURE.

Temple-Bar, London, England, an arched gateway which formerly stood between Fleet Street and the Strand; and divided the city from the liberty of Westminster. (See LONDON.) It was a structure of the Corinthian order, designed by Sir C. Wren, and built in 1670 of Portland stone. Over the gateway, on the east side, were statues of Queen Elizabeth and James I.; and on the west side, of Charles I. and II. The heads of persons executed for high treason were formerly exhibited on this gate. Here, also, on particular occasions, the corporation of London received the royal family, the heralds' proclamations, or any distinguished visitors. When the sovereign came in state the lord-mayor here delivered to him the sword of state, which was returned, and after this he rode bareheaded, immediately in front of the royal procession. As the gate seriously obstructed a crowded thoroughfare, it was removed in 1878, its site now being marked by the heraldic monster, a "griffin." The gate has been re-erected at Theobald's Park, Cheshunt.

Temple, Order of the. See ORDERS, ROYAL.

Tem'po, in music, a word used to express the rate of movement or degree of quickness with which a piece of music is to be executed. The degrees of time are indicated by certain words such as *lento* (slow), *adagio* or *largo* (leisurely), *andante* (walking pace), *allegro* (gay or quick), *presto* (rapid), *prestissimo* (very rapid), etc. See MUSIC.

Temporal Bone. See ANATOMY; SKULL.

Temporal Power (OF THE POPE). By this expression, in its generally received signification, is understood the sovereign civil rule which was exercised by the popes over the States of the Church with varying vicissitudes from the middle of the 8th century down to the year 1870, when the last remnant of the papal states was annexed to the United Kingdom of Italy.

The formal establishment of the temporal power dates from the year 754, when Pepin, king of the Franks, bestowed upon Pope Stephen II. (who had sought his aid against the oppression of the Lombards) independent sovereignty over some twenty cities, thus constituting what was henceforth known as the state or patrimony of Saint Peter. Though apparently a new departure — one possibly unlooked for on the part of the Pope himself — this addition of a temporal to the spiritual rule of the bishop of Rome was in reality but the natural outcome of pre-existing civil and political conditions. Among these may be mentioned the

fact that the Roman Church was already in possession of numerous and extensive landed estates or patrimonies situated for the most part within the bounds of the Italian peninsula, and which were controlled or administered by the popes through their agents.

This state of things had gradually developed from very early beginnings, for we find that even during the period of the persecutions, the local church of Rome (whether organized legally as a burial society, or simply as a body corporate, holding property under the general laws of the empire) possessed not only the great cemeteries now known as the Catacombs, but also other property, as is clear from the edict of Milan. By a law of 321, the Emperor Constantine granted to all persons capable of making a will the right to bequeath property to the Church, and he himself gave an example of generosity in this respect by endowing munificently the various basilicas of Rome. Similar bequests in one form or another were made by wealthy Christians throughout the empire, one of the principal uses to which the property thus acquired was applied being to relieve the distress occasioned by the depredations of the barbarians who began to overrun Italy from the beginning of the 5th century. In this way the Roman Church had become very wealthy, and the popes were already great landed proprietors, owning vast estates in various parts of Italy and elsewhere long before any form of political papal sovereignty had been thought of. Meanwhile, through the favorable legislation of the Christian emperors, the political role of the popes and of bishops in general, was assuming an ever growing importance. The bishop of a city was not only the official protector of the poor, of prisoners and of slaves; he had also in virtue of his office a voice concerning various points of civic administration. Even in provincial affairs he enjoyed important rights and privileges. Thus, among other things, we find that appeal could be made from the decision of an imperial magistrate to the tribunal of the bishop. Such being the political status of bishops generally, it is easy to understand that the powers granted to and exercised by the Roman pontiffs were still more extensive. To them, in particular, recourse was had against the exactions of the rapacious Byzantine governors who ruled in the different Italian provinces, and in this connection, as well as in other ways, the vigilant protection of the popes proved beneficial to the people. It must be remembered that during this period the civil and political situation throughout the peninsula was in a condition bordering on the chaotic. The chronic state of unrest and insecurity which resulted from the incursions of the barbarians and the deplorable inefficiency of the imperial administration, made the interference of the popes in civil matters a real practical necessity. Theirs was the only authority that commanded general respect, and the common weal demanded that they should look after the material as well as the spiritual interests of their flock. That such was the true condition of affairs is amply shown forth in the papal correspondence of the time, especially in the letters of Gregory the Great (590-604). It is also worth noting that though they had ever growing reasons to be dissatisfied with Byzantine rule, the popes (even those who succeeded Gregory) continued to remain faithful to the idea of a world-wide Christian empire, and exercised their influence to maintain in Italy its authority and prestige. But, as is well known, many of the emperors of that period were more preoccupied with theology than with matters pertaining to civil administration, and their repeated attempts to impose upon the bishops of the West subtle formulas of orthodoxy led to frequent conflicts, in some of which popes were violently dragged away to prison or death. Thus Silverius and Vigilius, Pelagius and Martin, became the victims of imperial tyranny. On the refusal of Sergius I. to accept the decrees of the Emperor Justinian II. the latter commanded the proto-spatharius Zachary to arrest the pope and bring him a prisoner to Constantinople, but the public spirit in Italy was already in revolt against this arrogant, high-handed policy, and the army interfered to prevent the execution of the imperial mandate. Again, in 727, Leo the Isaurian sent his edict against the use of images to Pope Gregory II. with orders for his deposition in case he should refuse to comply. Gregory responded by denouncing the edict and excommunicating the exarch; again the soldiers arose in his defense, and the efforts of the imperial officers to carry out their instructions cost them their lives. In 733 the emperor confiscated all the Church's estates in Sicily, Bruttium, Lucania, Calabria and Naples; others were confiscated by the Lombards, and no security remained even for the inhabitants of Rome. The empire was unable to defend its subjects — worse than that, it even oppressed and plundered them. The only refuge left to the Romans and their spiritual as well as actually temporal head was to seek the aid of the friendly king of the Franks. It is not clear whether Pope Stephen II. in taking this step had already in view the establishment of a civil principality under his own rule or not, but be that as it may, just then the relations between the papacy and the emperor were further strained by the publication of a fresh edict against the use of images emanating from a synod of Constantinople. A continuation of the old regime seemed no longer possible, the army of Pepin arrived in Italy in the summer of 754, and the independent state of Saint Peter was established, with the pope as its civil ruler, in the same year. In view of the circumstances, it may be truly said that this distinction was bestowed upon the bishop of Rome in recognition of a twofold prerogative, namely, his prestige as head of the Church and defender of orthodoxy against Eastern aggression, and his character of national benefactor.

The papal dominion as constituted by the grant of Pepin comprised the cities of Ravenna, Rimini, Pesaro, Fano, Casena, Forli, Commachio and 15 other towns. In 1053 the duchy of Benevento was annexed, and between that period and the end of the 13th century the authority of the Roman See was acknowledged by many other free towns in Italy. In 1278 the Emperor Rudolf I. confirmed the acquisitions made thus far, defined the boundaries of the papal states, and recognized the Pope's exclusive authority over them by absolving the inhabitants from their oath of allegiance to the empire. The papal dominion then included Perugia, Bologna, Bertinoro, the duchy of Spoleto, the exarchy of Ravenna and the marche of Ancona, but many of the towns were more or less

independent. The Romagna was annexed at the end of the 15th century. Under Alexander VI. and Julius II. were added Faenza, Parma, Placentia and Reggio, and the papal states received their final additions in the 17th century, namely, Urbino, Ronciglione and the duchy of Castro. In 1797 the Romagna was seized by Napoleon and incorporated into the Cisalpine Republic. The following year Rome itself was taken by the French, and the papal states were erected into the Roman Republic. Pius VII. regained possession of his states in 1800, but they were soon retaken by the French, and finally (1809) incorporated with France, Rome being reckoned the second city of the empire. After the downfall of Napoleon (1814) Pius VII. returned to Rome, and was formally reinstated in his office of temporal ruler by the treaty of Vienna, mainly through the friendly support of the non-Catholic powers Russia, Prussia and England. In 1830 a rebellion broke out in Ancona and Bologna, the reason alleged by the insurgents being that the clerical rule in the provinces contrasted too unfavorably with the preceding French administration. This revolt was quelled through the aid of Austria, but another uprising occurred soon after, and the Austrians took occasion thereby to occupy the northern legations, while at the same time the French placed a garrison in Ancona. Occasional minor disturbances occurred between these events and 1848, when Pius IX., on account of an insurrection, was obliged to flee to Gaeta and Rome was declared a republic. The Pope was again restored to power through the armed intervention of France, Austria, Spain and Naples, and the Austrians occupied the northern legations or Romagna on his behalf until 1859, when their army was withdrawn. Soon after the province repudiated its allegiance to the Pope and its annexation to Sardinia was proclaimed. The French still continued to hold Rome in subjection to papal authority, and Pius IX., with a view to withstand any further encroachments upon his dominions, raised an army, which was placed under the leadership of the able French general, Lamoricière. In the meantime Garibaldi and his followers, whose aim was the political unification of the Italian states under the rule of Victor Emmanuel, were conducting a successful campaign in Sicily and Naples. The news of this caused an outbreak in Urbino and the Marches in favor of Victor Emmanuel. The Sardinian troops came to the aid of the insurgents, and after two encounters with the troops under Lamoricière, compelled the latter to surrender with his whole army after a week's siege in Ancona (1860). The revolted provinces of Umbria, Urbino, and the Marches, as well as the isolated provinces of Benevento and Pontecorvo, situated within the kingdom of Naples, were immediately annexed to Sardinia. Finally, on 20 Dec. 1870, the French troops having been withdrawn on account of the war with Prussia, Rome was entered practically without resistance by the troops of Victor Emmanuel, and the last vestige of temporal power disappeared. Victor Emmanuel having been proclaimed king over united Italy, took up his residence in the papal palace of the Quirinal, and Pius IX. withdrew to a life of seclusion (in the Vatican), considering himself as a prisoner unable to leave his retreat without compromising his dignity as head of the Church, or even giving occasion to riots and bloodshed. He never ceased to protest emphatically against the spoliation of his rights as a temporal ruler, and against the presence of the king and his court in the papal city. Leo. XIII., though departing in many respects from the policy of his predecessor, maintained nevertheless throughout the same uncompromising attitude toward the question of the temporal power, and the same policy has recently been affirmed by the present pope, Pius X. Such are, in briefest outline, the main facts pertaining to the origin and history of this ecclesiastico-civil institution. It is beyond the scope of the present article to appreciate or criticise the motives either of those who labored to maintain it or of those who more or less directly sought its abolition. Still less pertinent to the purpose in view would be a speculation on the probable restoration of the same in the future. It must be granted that, considering the present political situation in Europe, the probability of a restoration of the temporal power, at least in its ancient form, seems rather remote. For all practical intents and purposes the different powers recognize as a *fait accompli* the incorporation of the papal dominions into the kingdom of Italy; though, on the other hand, it still remains true that this state of affairs has never yet received any formal, international ratification. Furthermore, the necessity, or even the utility, of such a restoration is a point concerning which there is considerable divergence of opinion even among Roman Catholics. It is a question concerning which no authoritative dogmatic pronouncement has been formulated by the Church; however, the firm and unmistakable attitude of the popes toward it cannot be looked upon by Catholics otherwise than deeply significant. All, even the most ultra-montane, must, of course, admit that the possession of a temporal sovereignty is not an essential prerogative of the successor of Saint Peter, since for so many centuries before it was established the Church was able to develop and fulfil so efficiently her mission in the world. Yet this temporal sovereignty is regarded by many as the means providentially established to protect the necessary independence of the Pope and the free exercise of his functions as spiritual head of the Church. Others, while admitting the main principle involved (namely, that the pope should be free in his spiritual capacity) take a somewhat different view of the case. They remind us that the temporal power was the outcome of peculiar, and to a great extent abnormal conditions. It was the best and perhaps the only solution at the time, and for centuries afterward of a vexed problem, partly political, partly religious; but at the same time it is not proved that had the conditions been otherwise some other regime of papal supremacy just as satisfactory would not have developed. But be that as it may, it is claimed that at least in the present social and political conditions of the Christian world, so different from those of the Middle Ages, the desired independence in spiritual matters can be secured without imposing on the Pope the burden of a temporal as well as a spiritual sovereignty. When, however, it is asked how this can be done, no very clear or satisfactory answer is forthcoming. It is plain from the

nature of the case, as well as from past experience — notably the sojourn of the papacy at Avignon — that to have the Pope under the control or protection of any secular prince is dangerous for the best interests of religion. If the head of the Church be not himself an independent sovereign, it is hard to conceive a situation in which he would be free from undue political or national influence, especially if he is to be either the subject or guest of some temporal ruler. It is for a similar reason that the founders of the American Republic wisely determined that the seat of the central or federal government should be located not in any of the States, but in a separate independent district, exempted from state jurisdiction, thus insuring greater freedom of action to the governing body whose duty it is to legislate impartially in the interests of the entire nation. These and other reasons are urged by the advocates of the temporal power, and when it is not unreasonably objected that during the third of a century that has elapsed since the occupation of Rome by Victor Emmanuel the pope has always enjoyed full freedom in the exercise of his spiritual jurisdiction; that never before has the moral influence of the papacy been so powerful and far-reaching, etc., the answer is made that while all this is true, there is nevertheless no sufficient guaranty that this liberty will continue to be granted in the future; that, moreover, the present situation of the papacy is certainly abnormal, and that the increase of moral influence is due in great part to the fact that the popes have maintained a firm attitude, refusing to become the allies of the Italian government. Not a few are of the opinion that in the present political status of the civilized world a system of international guaranties would be a much more effectual means of securing for the Pope the permanent free exercise of his spiritual jurisdiction than could result from a restoration of the temporal power. However that may be, the most thoughtful statesmen allow that the problem is complicated and delicate — that no solution thus far arrived at or suggested is free from grave practical difficulties. The temporal power of mediæval and later times was certainly not without grave drawbacks and disadvantages as regards the interests of both rulers and subjects. That it has been the occasion of many evils and abuses, that it has often been a real impediment to the spiritual efficiency of the papacy, few impartial students of history will venture to deny; yet it will doubtless be as readily admitted that being given the circumstances of the period the temporal power was a most useful, even necessary, factor in the evolution of Christianity; and whatever may be thought of its adaptability to future contingencies, it will not be a matter for surprise to find that so many are still convinced of its permanent necessity, at least until something better shall have been devised to meet the exigencies of the case, and shall have demonstrated its superiority by actual experience.

For a detailed discussion of the causes, remote and proximate, which led up to the establishment of the temporal power, consult the masterly studies of Duchesne in the 'Revue d' Histoire et de Litterature Religieuse' (Paris), Tomes I. and II.; also an interesting article by M. Hassett in the 'Catholic University Bulletin,' January 1904.

A sufficiently complete exposition of the arguments in favor of the temporal power may be found in an article by Archbishop Ireland in the 'North American Review,' Vol. CLXXI. (1901), p. 337. For the counter arguments consult an article in the same volume (p. 863), by R. de Cæsare, member of the Italian Chamber of Deputies. A very interesting and moderate discussion of the question from the standpoint of a loyal Italian Catholic may be found in the 'International Quarterly' (March-June 1904), by Marquis Filippo Crispolti, entitled 'From Leo XIII. to Pius X.'

JAMES F. DRISCOLL, D.D.,
President Saint Joseph's Seminary.

Ten Commandments. See DECALOGUE.

Ten-pounder, a fish (*Elops saurus*) closely related to the tarpon (q.v.), and called also bony fish, big-eyed herring, liza, etc. It is equally at home in the Atlantic as far north as the Carolinas, and in the Gulf of California. It reaches a length of 2 to 3 feet, and is long, straight, and slender, with a small pointed head and a large mouth. It is covered with small thin silvery scales, bluish above and white beneath, and its dorsal fin is slightly behind the ventrals. Capital sport is had in fishing for it.

Ten Thousand a Year, a novel by Samuel C. Warren (q.v.) published in 1841. This story, though regarded by critics as "ridiculously exaggerated and liable to the suspicion of being a satire on the middle classes," has held a certain place in fiction for more than half a century. The plot is ingenious, the legal complications are managed in a way that won the admiration of accomplished lawyers, and the story with all its faults contrived to arouse and maintain the reader's interest. In 1902 it was reissued in an abridged form as 'Tittlebat Titmouse.'

Tenacity, that property of material bodies in virtue of which they are capable of resisting a tension which tends to pull their parts asunder. Tenacity is commonly understood, especially in engineering practice, to signify the maximum resistance that a given body is capable of exerting in this manner, as reckoned in pounds (or tons) per square inch of the sectional area of the body; the sectional area being measured on a plane that is perpendicular to the direction in which the tension acts. Tenacity, in engineering, is synonymous with "tensile strength." For its values for various materials, see STRENGTH OF MATERIALS.

Tenaino, tē-nī'nō. See SHAHAPTIAN INDIANS.

Tenant. See RENTS, LAW OF.

Tenasserim, tē-năs'ĕ-rĭm, India, a maritime division of lower Burma, stretching from the Salwin River 500 miles southward into the Malay Peninsula, between Siam and the Bay of Bengal. Area, 36,086 square miles. It is for the greater part a mountainous wilderness. The chief product is rice, though the mountains are rich in minerals. The natives are chiefly Burmese Buddhists. Pop. (1901) 1,137,776.

Tench, a small cyprinoid fish (*Tinca vulgaris*), familiar in European fresh waters, especially slow-running and muddy rivers. The color is a greenish olive, tinted with a golden hue; the average length about 12 inches. The flesh is soft and rather insipid.

Ten'da Pass, or **Col de Tenda,** Italy, a pass of the Maritime Alps, Piedmont, in the province of Cuneo, between Tenda and Limone, on the carriage road from Nice to Cuneo. Its highest point is 6,195 feet above sea-level.

Tender, in law, an offer of compensation or damages made in a money action. A tender may be made through an authorized agent, and to make it valid the money must be actually produced. Making a tender may have the effect of freeing the defender from subsequent expenses if the tender is found sufficient. A tender made to one of several joint claimants is held as made to all. A tender of money for any payment is legal, and is called a legal tender, if made in current coin of full weight.

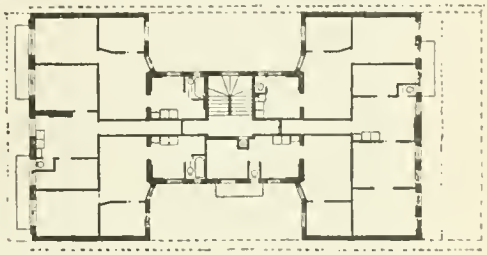
Tendon, or **Sinew,** a band of white fibrous tissue by which a muscle is attached to a bone or other hard part. Tendons are disposed in elastic bands or layers flattened or rounded, and more or less elongated. When very much flattened and membranous, they are called aponeuroses and sometimes fasciæ. They glide smoothly in sheaths, especially in the extremities; in some cases many are enveloped in a single sheath, in other situations they are kept in place by an annular ligament, as in the wrist and ankle. One of the most important is the Achilles tendon (q.v.), at the heel. Contractions of tendons are frequently remedied by subcutaneous tenotomy; torticollis (q.v.) is also benefited by the division of the tendon of the sternomastoid muscle. Inflammation of the tendon sheaths, or tenosynovitis, about the wrist or ankle is a common and painful affection usually due to strain or over exercise. Rest and mild counter irritation are the principal elements in the treatment. Ganglion, or «weeping sinew» is a localized, round, fluid swelling developing in connection with a tendon sheath and occurring usually at the wrist or on the dorsum of the foot. The treatment is surgical. One of the most beautiful contrivances in the human body is the manner in which the superficial flexor tendons in the fingers stop short at the middle phalanx, and divide to allow the tendons of the deep flexor to pass through to the terminal phalanx, thus securing compactness and beauty of shape, with freedom and extent of motion.

Ten'drac. See TANREC.

Tenedos, tĕn'ĕ-dŏs, Asia Minor, an island in the Ægean Sea, off the Troas coast, belonging to Turkey. It is six miles long by three miles wide, is of volcanic formation, with rugged surface, but highly fertile, and celebrated for its wine. Pop. 5,000.

Tenement House, a multiple dwelling arranged for the occupation of several families, each of which can live independently and do its cooking within its apartment. The legal definition varies somewhat in different cities. In New York, Philadelphia, Washington, Buffalo, and other cities, it is such a house for more than two families. In Chicago, Boston, and Saint Louis the line is drawn at more than three families. Tenement house is a generic term, including what are popularly called apartment houses and flat houses or flats, as well as tenements. The attempt has sometimes been made in framing tenement house laws or regulations to distinguish between apartment and tenement houses, but no satisfactory line of separation has ever been suggested, nor is there any legal regulation properly applicable to tenement houses, as popularly defined, which should not equally apply to apartment houses, or which presumably would not be adopted by intelligent owners of such houses from motives of self-interest.

Tenement House Reform.— A movement to better the housing conditions of the working classes in cities, which originated about the middle of the 19th century and has gradually become national in character in the United States and Great Britain. In the United States it has taken the form of the regulation by State law or city ordinance of the construction, maintenance and care of tenement houses, whence its title. In Great Britain this movement has been directed to all kinds of houses, including tenement houses, and is usually called by its more generic title of "Housing Reform." The initiative of the movement has been benevolent impulse, but the strong forces behind it which



A new law tenement with no room opening on a court narrower than 12′ 6″, with every room light and well ventilated, and with separate water-closets for each apartment and baths for some.

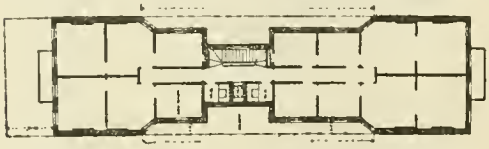
have given impulse to that initiative and have united to carry the movement forward have been the same which have evolved sanitary and building regulation, and are founded quite as much on self-interest as altruism.

History.— The movement for tenement house reform in the United States naturally began in New York, its largest city, where the need for regulation first became apparent, and may be said to date from 1842, when Dr. John H. Griscome, the city inspector of the Board of Health, called attention to tenement conditions in a special report on the sanitation of the city. It has since exended to almost all large cities in which tenement houses have been erected, and has taken the form sometimes of state law, as in New York and Massachusetts, or more often of city ordinance, as in Chicago and Philadelphia. The legislation in New York is the result of the investigations and recommendations of successive State commissions — 1856, 1884, 1894, 1900 — and the scope of inquiry of the last commission, which is typical, has been "To make a careful examination into the tenement houses in cities of the first class; their condition as to the construction, healthfulness, safety, rentals, and the effect of tenement house life on health, education, savings, and morals of those who live in tenement houses and all phases of the so-called tenement house question in these cities that can affect the public welfare." The chief subjects of tenement house regulation may be grouped under three general classes: protection against fire and means of escape in case of fire, light and ventilation, and sanitary protection, the latter including

water supply, water-closet accommodation and overcrowding.

Fire Protection.— Protection against fire is almost universal. Structural provisions directed to this end are contained in the building laws of all cities. In New York, Philadelphia, San Francisco, Jersey City, Providence, Syracuse, and Nashville, all tenements must have fire escapes. All tenements over two stories in height must have fire escapes in Saint Louis, Baltimore, Louisville, Minneapolis, Saint Paul, Denver, Toledo and Columbus. In Chicago, Cleveland, and Cincinnati, this rule only applies to tenements over three stories in height. In many cities tenements must be fire-proof throughout when over a certain height. In Philadelphia this is true of all over four stories; in Washington of those over five stories; in New York, Buffalo, Louisville, Minneapolis and Denver, of those over six stories in height. In Boston the limit is 65 feet.

Light and Ventilation are protected by minimum open spaces, and by a limitation of the percentage of a lot which can be occupied by a building. In Philadelphia there must be open spaces at the side or rear, equal to one fifth of the lot area, and the minimum width of all spaces is eight feet. In Buffalo, under the local



A typical floor plan of the "dumb-bell" tenement, so called, lawful up to 1901, all the interior rooms of which are lighted and ventilated on a narrow air shaft only 2′ 4″ in width; in which there is no separate water-closet accommodations for the different apartments and no bathing facilities.

law in force before the general State act of 1901 was passed, the minimum width of any outer court was six feet in two-story buildings, eight feet in three- and four-story buildings, and one additional foot in width for each additional story. The minimum interior court was eight by ten. In Boston, a clear open space at the rear must be left equal to one half the width of the street on which the tenement fronts, and there must be two open spaces at least 10 feet wide. In some cities the required court area is expressed in square feet, without regard to minimum width or length, and increases proportionately with the height of the building. This principle is adopted in New York, where the minimum width of exterior courts in buildings five stories high is six feet on the lot line and twelve feet between wings, and the minimum area of interior courts on the lot line in buildings of the same height is 12 by 24. These dimensions are increased or decreased according as the building is higher or lower. Tenement houses in New York must have an open yard at least 12 feet wide in the rear. The maximum percentage of lot area which may be occupied by the building differs, properly, according as the lot is an interior or a corner lot. As respects interior lots, this limitation in New York and Buffalo is 70 per cent; in Boston 65 per cent; in Philadelphia 80 per cent. The height of rooms is almost universally regulated, the minimum usually being eight feet. The height of tenements is limited in many cities. In New York it is limited to one and one half times the width of the street on which it faces.

Water Supply.— In New York water must be furnished on each floor. In Philadelphia and Buffalo, on each floor, for each set of rooms. In Boston, Chicago, Jersey City and Kansas City, in one or more places in the house or yard. Water-closet accommodation is very generally prescribed. In Philadelphia, and in New York under the new law of 1901, there must be one for every apartment. Under the previous law in New York, and at present in Chicago and Detroit, there must be one for every two families. In other cities the unit is the number of persons. It is 20 persons in Boston, Baltimore and Denver; 10 persons in Rochester.

Law Enforcement.— The enforcement of tenement house law in American cities is usually vested in existing city departments to which it is most germane. These provisions, which relate to the construction of new buildings and the alteration of old ones, are naturally enforced by a building department or by whatever part of a city government has charge of the enforcement of building regulations. Sanitary regulations are, for a like reason, usually enforced by a board of health or by whatever city officer supervises the enforcement of health laws in general. In the city of New York previous to 1901, the enforcement of such regulations was divided between the Building Department, the Health Department, the Fire Department and the Police Department. Under such divided responsibility many of them were not enforced at all, and the enforcement of others was extremely lax. Moreover, the tenement house problem in New York was an exceptionally large one. Of its population of nearly 3,500,000, nearly 2,500,000, or more than two thirds, lived in tenement houses as legally defined. Under these circumstances the State Commission of 1900 recommended the establishment of a separate tenement house department in the city of New York. This department was established under the new charter of the city which went into operation in 1902, and centres in itself all the municipal duties toward tenement houses and their inmates, as such, which were previously divided among the other city departments.

Model Tenements.— The erection of model tenements, so called, of large size, from motives primarily philanthropic, has been less frequent in the United States than in Great Britain. The best known and earliest are the "Home Buildings" and "Tower Buildings," which were erected by Alfred T. White in Brooklyn; the first named in 1879. The erection of these buildings, which have been financially successful from the start, was an epoch in the cause of tenement reform. It led indirectly to the tenement house law of 1879. The most recent model tenements are those of the City and Suburban Homes Company, of New York, of which E. R. L. Gould is president.

Great Britain.— The movement for housing reform in Great Britain has had a somewhat different direction from its American counterpart. The evils there have been more largely slum conditions than those resulting from tall buildings and unventilated and unlighted rooms. The particular evils of the tall tenement practically exist only in Edinburgh and Glasgow. Consequently English and Scotch effort has been

1. 2.

No. 1. Typical interior court or "air-shaft" of old-law, New York, tenement house, lawful prior to 1901; 2 feet 4 inches wide; no air duct at the bottom; rooms mostly dark and not ventilated.

No. 2. Typical interior court of new-law, New York tenement house, lawful since 1901; minimum dimensions for five-story house 12 feet by 24 feet; air intake at bottom; all rooms light and well ventilated.

directed mainly toward the demolition of unsanitary areas, and more recently, the erection of municipal tenements by the city governments themselves. These movements, at first local and authorized under local acts, such as the Glasgow Improvement Act of 1866, and the Liverpool Sanitary Amendment Act of 1868, have been made general by the Housing of the Working Classes Act of 1890, and many slum areas have been destroyed and municipal tenements built in their place, notably in the cities of London, Glasgow, Manchester, Liverpool and Edinburgh. Tenement house regulation in Great Britain emphasizes the same general subjects and follows the same lines as American regulation. Limitations upon height are general, and more drastic than in America. Such houses are limited in London to 80 feet, without special consent of the council, and may not exceed the distance between the front wall of the building and the opposite side of the street in streets less than 50 feet wide. In Edinburgh they are limited to one and one quarter times the width of the street; in Liverpool and Glasgow to the actual width of the street; in Manchester to two stories in streets of less than 30 feet in width and to three stories in wider streets up to a width of 36 feet. Tenement regulations on the Continent usually form part of the general building regulations. The regulations for Paris and Berlin are very elaborate, but proceed under the same general lines as in English and American cities. In Berlin, houses fronting on the street may only be as high as the width of the street. In Paris a somewhat greater latitude is allowed in this particular.

No American city has imitated the English example of building municipal tenements, nor has such action ever been seriously proposed. Serious objections to any such extension of the sphere of municipal activity would exist in any American city. Moreover, municipal building would discourage and restrict building by private enterprise, which has proved sufficient to meet the demand. The problem is too large for any American city to deal with it successfully by the use of any amount of public funds likely to be put at its disposal for such purposes. Halfway measures by preventing private enterprise would only increase the evil which they sought to remedy.

Bibliography.— De Forest and Veiller, 'The Tenement House Problem' (1903); Gould, 'The Housing of the Working People' (1895); Riis, 'How the Other Half Lives' (1890); 'The Battle with the Slum' (1899); 'First Report of the New York Tenement House Department' (1904).

ROBERT W. DE FOREST,
Tenement House Commissioner, New York.

Teneriffe, tĕn-ēr-ĭf', the largest of the Canary Islands. It is 60 miles long, 10 to 25 miles wide, and has an area of 782 square miles. The coasts are precipitous, and the interior rises in the volcanic Peak of Teneriffe, or Pico de Teyde, to a height of 12,192 feet. This mountain has been quiescent for two centuries. The soil is very fertile, and produces dates, cocopalms, fruit, grain, cotton, sugar, and grapes. The chief town and the capital of the Canary Islands is Santa Cruz de Tenerife, situated on the northeastern coast. Pop. of the island (1897) 128,337. See CANARY ISLANDS.

Teniers, tĕn'yĕrz (Fr. tā-nē-ār), **David,** THE ELDER, Flemish artist: b. Antwerp 1582; d. there 29 July 1649. Having studied under Rubens, he went to Rome, and remained there 10 years. On his return to his native country he occupied himself principally in the delineation of fairs, shops, rustic sports, and drinking parties, which he exhibited with such truth, humor, and originality, that he may be considered the founder of a style of painting which his son afterward brought to perfection. He also painted some landscapes with scriptural or mythological figures in the foreground. A picture from his hand was sold in 1886 for $2,275. His 'Dutch Kitchen' in the New York Metropolitan Museum gives a fair example of his style. This canvas is 45½ by 39 inches and therefore much larger than the majority of his pictures.

Teniers, David, THE YOUNGER (son of the preceding), Flemish artist: b. Antwerp December 1610; d. Brussels 25 April 1690. He received his early instruction in his art from his father, and his style was improved by copying 200 pictures in the gallery of Archduke Leopold William to whom he had been appointed painter. This copying degenerated into servile imitation, and he produced such perfect facsimiles that they deceived even connoisseurs, and he has been styled the "Ape of Painting." Yet he had also a strong vein of originality and his paintings of low life in Flanders are excellent examples of genre. Although refined in mind and manners and patronized by such men as Prince John of Austria, son of the Emperor Charles V., he preferred to immortalize by his brush the card table and drinking party of boors, and was to the last the enthusiastic painter of the pot-house, and the guard-room with its rollicking soldiery. There are at least 2,000 of his pictures at present in existence, six of them being hung in the New York Metropolitan Museum of Art, though none of these latter excepting 'A Marriage Festival,' can be called representative of the artist's style and quality. Like Rubens, some of whose manner he inherited from the teaching of his father, a pupil of the former, he was a rapid executant; many of his works are mere sketches, others elaborated with exquisite virtuosity. His touch is light but sure, and his coloring exceptionally fine, while for animation and power of expression he remains the first of Flemish genre painters. His works are highly prized and his 'Village Fete' was sold in 1850 for $15,750. Consult: Rosenberg, 'Teniers der Jüngere.'

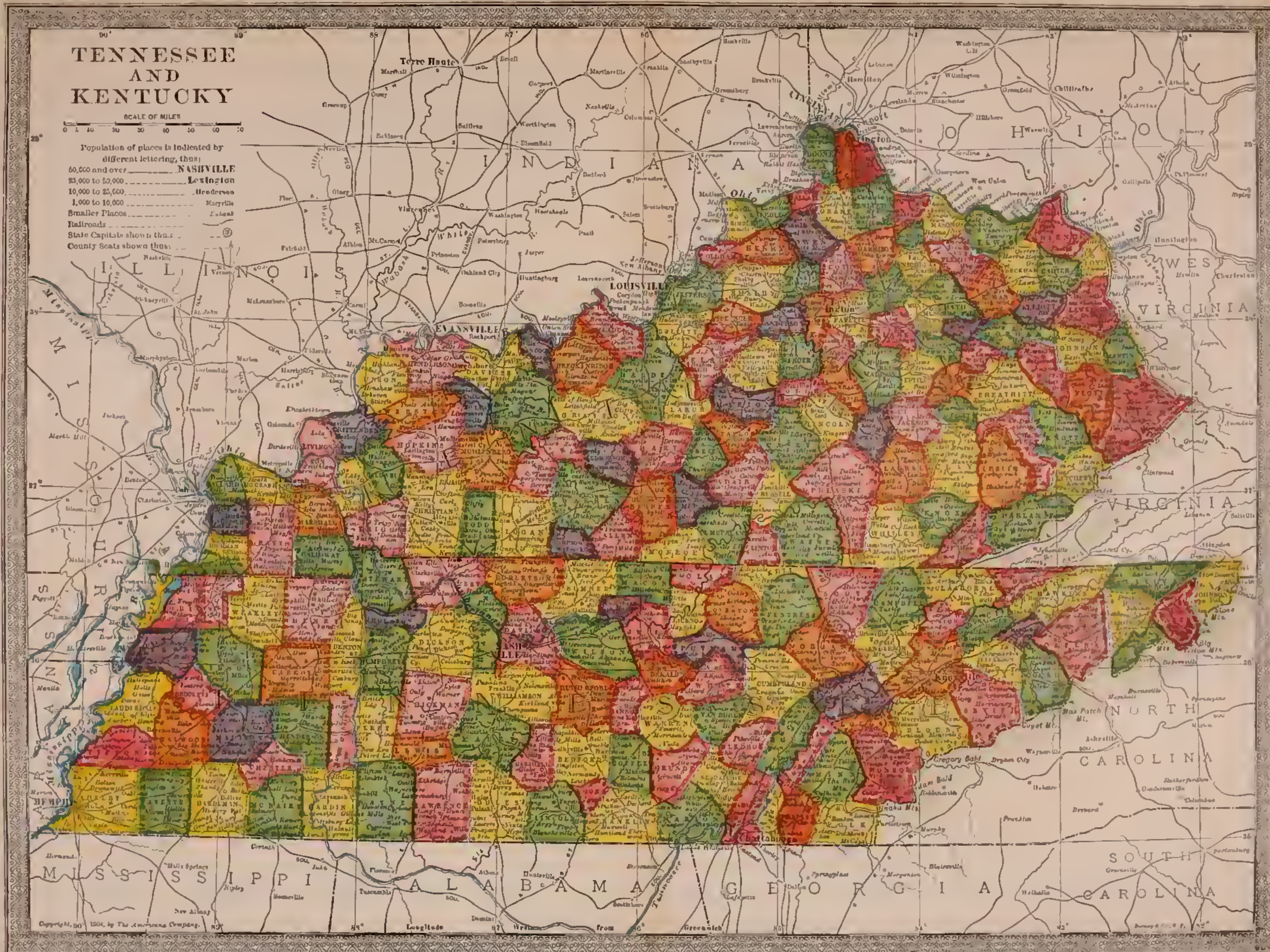
Ten'nantite, an isometric, metallic mineral, isomorphous with tetrahedrite. It is essentially a copper sulph-arsenite, differing from tetrahedrite into which it passes by insensible gradations, only in the preponderance of arsenic instead of the antimony which distinguishes the latter. Its color and streak are usually iron-black; it often has a brilliant metallic lustre; its hardness varies widely from 3 to 4.5; its specific gravity is also quite variable, 4.4 to 5.1. It occurs in fine specimens in the mines of Cornwall, England, in Bolivia and Colorado. When sufficiently abundant it constitutes a valuable copper ore.

Tennessee, tĕn-ē-sē ("The Volunteer State"). The State of Tennessee lies between lat. 35° and 36° 30′ N. and lon. 81° 37′ and 90° 28′ W. In shape it is rhomboidal. Its greatest

length from east to west is 385 miles, and its extreme width 109 miles. The longest straight line that could be drawn in the State would be from the northeastern corner of Johnson County to the southwestern corner of Shelby County, and would be nearly 500 miles long. The area is 42,050 square miles, of which 300 are covered by water, leaving a landed surface of 41,750 square miles. It is bounded on the north by Kentucky and Virginia, on the east by North Carolina, on the south by Georgia, Alabama and Mississippi, and on the west by Arkansas and Missouri, thus touching eight other States, and, with the exception of Missouri, no other State has so many States on its borders.

Topography.— Tennessee has eight well-defined natural divisions: (1) On its eastern borders rises in great ridge-like masses and treeless domes the main axis of the Appalachian chain, the loftiest peaks of which attain an elevation of 6,600 feet above the sea. Many beautiful valleys and coves nestle amid this grand range of mountains. This division is known as the Unaka or Smoky Mountains, and has an area, approximately, of 2,000 square miles. (2) Adjoining these mountains on the west is the second natural division, called the Valley of East Tennessee, which lies between the Unakas on the southeast and the Cumberland Mountains on the northwest. This valley has a fluted bottom, made up of a succession of minor ridges and valleys that resemble the long waves of a stormy ocean that have been arrested and fixed in stony firmness. Viewed from the mountains on either side these minor ridges and valleys melt into a common plain. This valley has an area of 9,200 square miles, and is of great agricultural value. It is the extension of Shenandoah Valley of Virginia. (3) Next in order, going westward, is the Cumberland table-land that rises in massive proportion 2,000 feet above the sea and 1,000 feet above the last mentioned division. It forms a bold escarpment, on its eastern edge presenting a formidable gray, rocky, cliff-lined rampart. Its western edge is irregular and jagged, notched and scalloped by re-entrant coves and valleys, which are separated by finger-like spurs, pointing for the most part in a northwesterly direction. The area of this division is 5,100 square miles. (4) Resting against the western edge of the Cumberland table-land and extending to the elevations bordering the Tennessee River in its return across the State are the Highlands, or Rimlands, having an average elevation of 900 feet above the sea. For the most part this division is a flat plain furrowed by numerous ravines and traversed by frequent streams. Its area is 9,300 square miles, and it surrounds, in an irregular circle, the next division. (5) In the centre of these Highlands there is a depression or Central Basin, elliptical in shape, resembling the bed of a drained lake with an area of 5,450 square miles. It is the finest agricultural region in the State, and is on an average 300 feet lower than the Highlands that border it. (6) The valley of the Tennessee River comes next on the west. Its surface is broken and irregular, and it stretches across the State from south to north on both sides of the Tennessee River. It has an average width of 12 miles and an elevation of 350 feet. Its area is approximately 1,200 square miles. (7) The Plateau, or slope of West Tennessee, constitutes the seventh natural division and differs from all the other divisions mentioned in having but few hard rocks, those occurring only in a narrow belt bordering the Tennessee River. It is a great plain sloping gradually toward the Mississippi River. For the most part, the surface is gently rolling, but sometimes furrowed with low valleys bordering streams that flow in sluggish currents to the Mississippi River. Its area is 8,850 square miles, with an average elevation of 500 feet. It abruptly terminates in a line of bluffs that overlooks the great alluvial plain or bottom lands of the Mississippi River next to be mentioned. (8) The Mississippi Bottoms constitute the eighth and last of the natural divisions of the State. It is a low, flat plain, studded with lakes and clothed with dark forests. Much of its area lies below the high water of the Mississippi River, and as a result there are many swamps and marshes. The area of this division is 950 square miles, and its elevation above the sea is 300 feet. A very singular topographic feature is Sequatchie Valley, an outlier of the Valley of East Tennessee, which is a deep trough extending in a northeasterly direction from the south boundary of the State, dividing the southern end of the Cumberland table-land into two unequal arms, the more easterly being known as Walden's Ridge. The valley has its head about midway between the northern and southern boundaries of the State, and is about 60 miles in length and from three to five miles wide. It is enclosed by rocky walls, approximately 1,000 feet high. Through the centre of the valley a beautiful stream flows, seemingly upon a ridge, as all the strata, forming the floor of the valley, dip toward the mountain escarpments on either side. Lookout Mountain is a portion of the Cumberland table-land cut off by the Tennessee River. It rises to the height of 2,300 feet and is a striking picture in the landscape around Chattanooga.

The following are some of the highest points in the State: Luftee Knob, on the North Carolina line, 6,238 feet; Mount Guyot, 6,636 feet; Mount Henry, 6,373; Roan Mountain (Cold Spring), 6,132; High Knob, 6,306; Indian Grave Gap, 4,288; Bear Wallow Mountain, 4,659. The Bullhead group in Tennessee shows the following heights: Mount Le Conte, 6,612; Mount Curtis, 6,568; Mount Safford, 6,535; Cross Knob, 5,931; Master Knob, 6,013 feet. All these elevations form a part of the great Smoky or Unaka Mountains, the principal range of the Appalachian chain. They all, with few exceptions, are on or near the line that separates Tennessee from North Carolina. There are a few points on the eastern border of the Cumberland Range which rise above 3,000 feet, but the western border averages a greater height than the eastern, as the strata dip northeasterly, and the coal seams that outcrop on the western slope, 1,600 to 1,800 feet above the sea, often disappear on the eastern slope beneath the general surface. The Alleghany range of Pennsylvania and Virginia becomes the Cumberland Table-land in Tennessee and the Sand Mountain in Alabama. The Blue Ridge of Pennsylvania, Virginia, and North Carolina takes the name of Unaka or Smoky Mountains in Tennessee. The Holston and the Clinch, the Chilhowee, and Lookout are a few among many de-


TENNESSEE AND KENTUCKY
SCALE OF MILES
Population of places is indicated by different lettering, thus:
50,000 and over .... NASHVILLE
25,000 to 50,000 .... Lexington
10,000 to 25,000 .... Henderson
1,000 to 10,000 .... Maysville
Smaller Places
Railroads
State Capitals shown thus
County Seats shown thus
INDIANA
ILLINOIS
OHIO
MISSOURI
WEST VIRGINIA
VIRGINIA
NORTH CAROLINA
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
ARKANSAS
LOUISVILLE
EVANSVILLE
Terre Haute
Chattanooga
Copyright, 1904, by The Americana Company.
Longitude West from Greenwich

ached mountains in Tennessee. The long, straight valleys lying between the many parallel ridges and overlooked by them, but open to the northeast and southwest, are often rich, populous, and beautiful — centres of industry, intelligence, and a diversified system of agriculture. Taking the State altogether it will be seen that the topography is greatly diversified by mountains and valleys, hills and dales, rocky heights and broad plateaus. The great elevations on the east are offset by the low valley of the Mississippi River on the west. Between these are three great plateaus and two marvelously fruitful valleys all differing in height, area, soils, climate, and productions. It is indeed a State of almost infinite variety in its natural features, resembling the characteristic features of the eight States that border it, and all brought together as if by way of contrast.

Hydrography.— The State is threaded with streams that supply water for navigation and for economic purposes. The Mississippi, the Tennessee, and the Cumberland form the great drainage basins of the State. The Tennessee and Cumberland are tributaries of the Ohio River, which in turn flows into the Mississippi, so that all the streams which drain the State, with the exception of a few insignificant streams that flow through a small area next to the Georgia line, find their way through the Mississippi River into the Gulf of Mexico. Of all the streams in the State, the Tennessee River and its affluents, the Holston, the Clinch, the French Broad, the Elk and Duck rivers may be considered the main arterial currents and with their tributaries they drain over 40,000 square miles, about 32,000 of which are in the State of Tennessee. Rising in southwestern Virginia and western North Carolina the Tennessee River crosses the State twice and furnishes to it 320 miles of navigable water. It is by far the largest tributary of the Ohio, and in the volume of water it may be considered the principal stream. The Cumberland River is remarkable for being navigable canal-like 518 miles out of a total length of 650, 315 miles of which are in Tennessee and the remainder in Kentucky. The Mississippi River supplies approximately to the State 200 miles of navigation. The Holston, French Broad, Clinch, Elk, and Duck rivers, all tributaries of the Tennessee, are floatable in high tides for logs and flat-boats for many miles, though rarely navigable for steamboats. Obey's River and Caney Fork, tributaries of the Cumberland and the Obion, Forked Deer, and Hatchie, tributaries of the Mississippi River, are navigable for 20 miles or more at high tides. Tennessee has approximately 1,200 miles of navigable waters.

The Cumberland River, from an economic point of view, is the most important stream in the State. On it are situated the capital city and numerous other towns that have a large river trade. For eight months in the year from five to eight steamboats are kept employed in this trade, besides a large number of barges for carrying lumber, staves, hoop-poles, and cross ties. Improvements are now being made by the general government that will extend the period of navigation fully two months in the year. These improvements consist of building locks and dams and pooling the water so as to deepen it in shallow places. When this work is finished the great coal fields lying upon the river will be developed and cheap coal will be supplied to the many manufacturing towns along its banks.

Climate.— Tennessee has a double climate, one resulting from elevation and the other from latitude. Taking the lowest point on the Mississippi River and comparing it with the highest point of the Smoky or Unaka Mountains, it will show a difference in elevation of over 6,000 feet. This gives to that portion of the State lying on the Mississippi River, the climate of the Highlands of Louisiana, while the mountainous region of the State has the climate of Montreal, with this difference, however, that the extremes of heat and cold are less, though the mean temperature is the same. The winters are milder and the summers cooler. The flora bear out this statement, for there are many trees sub-Alpine in character, on the elevated mountains not seen farther south than Nova Scotia. On the other hand many of the plants in the Mississippi bottoms are tropical in character. The mean temperature for the State, deduced from approximate normals, the result of observations running back from 18 to 30 years, is about 59°; for the Eastern Division, it is about 57°; for the Middle Division, about 60° and for the Western Division, about 61°. The mean annual temperature along a line running east and west through the centre of the State, is for the Unaka Range, 45°; Valley of East Tennessee, 58°; Cumberland Table-land, 55°; Highland Rim, 58°; Central Basin, 60°; Plateau of West Tennessee, 61°; Mississippi Bottoms, 62°. The difference amounts to 17°, due mainly to elevation. The thermometer has registered as low as from 10° to 15° below zero five times in a period of 50 years and frequently rises to 90° and 100° for a few days in summer. The mean annual temperature of Tennessee is that of some of the most delightful regions of the globe. Its isotherms run through North Carolina, Spain, the southern parts of France, Italy, Greece, and Smyrna; cross the Caspian Sea near its southern extremity; pass through the tea-growing districts of China and the Japan Islands, and re-enter the United States near San Francisco. The variation in heat is not so great in the European states mentioned as in Tennessee. The summers of Tennessee are hotter and the winters colder. For this reason the orange, the olive, and the lemon do not mature in Tennessee. For the growing of those plants that require a high degree of heat, such as Indian corn, tobacco, cotton and melons, Tennessee is well adapted, but the countries of the same isotherms in Europe cannot produce them profitably. The winters are usually cold enough in the northern half of the State to secure ice. A median line drawn east and west through the State is the southern limit of domestic ice houses. The average annual amount of precipitation (including rain, hail, sleet, and melted snow) for the State is about 50 inches and is distributed as follows: January, 5.08 inches; February, 5.08 inches; March, 5.61 inches; April, 4.29 inches; May, 3.91 inches; June, 4.13 inches; July, 4.61 inches; August, 3.56 inches; September, 3.08 inches; October, 2.34 inches; November, 3.76 inches; December, 3.82 inches.

Geology.— The geological formations of the State are numerous and varied. They embrace almost every formation found in the United

States from the Archæan to the Quaternary. Many of these formations are made up of rocky strata or masses such as limestones, sandstones, slates, gneisses, and other granitoid rocks. In the western part of the State the materials forming the strata are unconsolidated clays and sands. The crystalline rocks of the Azoic age are found in four small disconnected areas, lying on the North Carolina line, the whole not embracing over 200 square miles. The Ocoee group and the Chilhowee sandstones of the Potsdam period of the Lower Silurian age make up, for the most part, the Unaka Mountains. These groups include heavy beds of conglomerates, sandstones, clay slates, talcose, chloritic and roofing slates. These are mountain-yielding formations. The larger part of the surface of the valleys of East Tennessee is formed by the outcrops of the Knox dolomite limestones, including variegated marbles, while the Knox sandstone forms the intervenient ridges between the minor valleys. The Knox shales make a valley-yielding formation, and many long beautiful and fertile valleys have their origin from the weathering of these shales. The Trenton rocks of the Lower Silurian are abundant in East and Middle Tennessee and occupy in the former two large belts southeast of the middle line and many long narrow strips making as many valleys northwest of the same line. The strata in East Tennessee are much tilted, folded and broken and there are numerous faults, some of them bringing formations together of widely different ages. The Clinton red-ore of the Upper Silurian age is thrown in juxtaposition with the coal-bearing strata, greatly reducing the cost of assembling the materials for the iron manufacturer. The Trenton rocks, largely dolomite, marble and chert, form the floor of Sequatchie Valley. In the Central basin the Trenton limestones constitute the principal rocks and they lie approximately horizontal. Their disintegration forms the most fertile soils in the State. The lower Helderberg rocks, like the Niagara limestones, have their greatest development on the borders of the Tennessee River. The Devonian age is represented by the black shale which outcrops in narrow lines in East Tennessee, the Central basin and in the valley of Tennessee. The rocks of the Lower Carboniferous age rest upon the Devonian and are found in the valley of East Tennessee and in the Highland Rim. The barren group of silicious rocks, the Saint Louis, or Coral limestone, and the mountain limestone constitute the principal rocks of this formation. The Carboniferous rocks that carry the coal measures are confined to the Cumberland Table-land. These consist of sandstones and shales with intercallated seams of coal. The formations found in the western division of the State, with the exception of a narrow border of hard rocks lying on the Tennessee River, are the Cretaceous, the Tertiary, and the Quaternary of the Mesozoic and Cenozoic eras. These form belts running north and south of greater or less width, the most easterly or the older formations dipping in succession under the others in going west. These belts are made up of sands, rotten limestones, loess, and alluvium. Artesian wells are common in these belts.

The Soils.— The soils, as may readily be inferred from the great number of geological formations in the State, are greatly diversified, and run from loose sands to heavy clays with innumerable modifications, making soils adapted to almost every variety of vegetable life. The limestone and alluvial soils are predominant, but there is a large area of arenaceous soils on the Cumberland Table-land and some granitic soils in the counties adjoining the North Carolina line. Portions of West Tennessee are covered with a thick stratum of loess and alluvium, which furnishes soils of the greatest fertility and durability. In Middle and East Tennessee the soils, for the most part, are residual, their quality and constituent elements being determined by the underlying rocks.

Forests.— But few States in North America can show a greater variety of valuable timber trees than Tennessee. Almost every tree to be found in the United States grows in the State; and this is due partly to the great diversity of soil, partly to the abundant rainfall and partly to the great difference in elevation which gives a great variation in climatic influences. One hundred and forty varieties of trees have been collected in Tennessee.

Among the list of indigenous trees are four varieties of ash, three of birch, two of beech, two of magnolia, five of elm, two of fir, four of gum, eight of hickory, four of locust, three of mulberry, three of maple, four of poplar, six of pine, three of sycamore, fourteen of oak, three of willow, two of walnut, besides many single valuable kinds, such as red-cedar, chestnut, cypress, cotton wood (true poplar), pecan, linden, spruce, chittem wood, dogwood, tiswood. Every part of Tennessee was originally covered with heavy forests in which many species were nearly evenly distributed. The tulip tree (locally, poplar), the white oak, red oak, hickory, gum, black walnut, wild cherry, basswood, ash, elm, and beech are interspersed with one another, while cypress abounds in the swamps, and pine on the Cumberland Table-land, and red cedar in spots in the Central basin. The unimproved and forest lands in the State amount to 16,474,050 acres.

Agriculture and Stock-raising.— Agriculture is the leading industry in Tennessee. There were 59.8 per cent of its population engaged in this occupation, in 1900, on 224,623 farms, embracing 20,342,058 acres, of which 10,245,950 acres were improved. The average size of farms was 90.6 acres, of which 45.7 acres were improved. This shows an increase in the number of farms in 10 years of 49,611 and a reduction in the size of farms from 116 to 90.6 acres. There were 114,929 owners, 13,652 part owners, 62,792 share tenants and 28,348 cash tenants in 1900. The value of farm property, including livestock, in 1889 was $312,891,650, of which livestock was valued at $60,254,230. The value of farm products was $55,194,181. In 1899 the value of farm property was $341,222,055, of which live stock was valued at $60,818,605. The value of farm products was $106,166,140; not fed to live stock, $87,736,130.

The leading crops that are grown in Tennessee are Indian corn, wheat, tobacco, cotton, peanuts, sorghum, oats, hay, fruits, and vegetables. Much attention is given to the breeding of livestock. By the census of 1840 Tennessee outranked all the States in the production of Indian corn; in 1850 it took the first place in the production of swine and in 1860 in the production

CAPITOL AT NASHVILLE.

of mules. As a stock-raising State, Tennessee ranks high. It has been eminently successful in the breeding of all classes of live-stock. Its horses have carried away honors on every race course in America and one of them won the Derby in England. The highest premium for the finest wool ever produced was won at the World's Fair in London, in 1851, by a fleece from a Tennessee-bred sheep. The pacing, trotting, and riding horses bred in the State command the highest prices both in America and England. The best herds of Jerseys, short-horns, Devons, and Sussex cattle are found in Middle Tennessee. The mules of Tennessee bred from blooded mares bring fancy prices. The value of all poultry raised in 1899 was $4,282,740.; number of eggs produced 31,807,990 dozens; value of bees $486,536. The following table will show the quantity of the principal crops and the number of live-stock, as reported by the census, for the years mentioned:

	1889	1899	Acreage 1899
Corn, bu.....	63,635,350	67,307,390	3,374,574
Wheat, bu.....	8,300,789	11,924,010	1,426,112
Oats, bu.....	7,355,100	2,725,330	235,313
Tobacco, lbs.....	36,368,395	49,157,550	71,849
Cotton, bales....	190,579	211,641	623,137
Peanuts, bu.....	523,088	747,668	19,534
Hay, tons.....	630,417	679,450	645,617
Irish potatoes, bu.	2,738,459	1,404,097	27,103
Sweet potatoes, bu	1,973,025	1,571,575	23,374
Peas, bu.....	.....	760,663	82,841
Horses, number..	311,842	328,535	.....
Mules, number...	198,172	228,976	.....
Cattle, number...	965,339	997,839	.....
Swine, number...	1,922,912	1,976,984	.....
Sheep, number...	540,996	499,277	.....

The value of miscellaneous vegetables for 1899 was $3,339,132. The value of the forest products which the farmers cut in connection with their ordinary farming operations and not included in the lumbering operations, was for 1900, $5,086,624. The counties growing tobacco for foreign shipment lie in Middle and West Tennessee adjoining the Kentucky line. Montgomery, Robertson, Stewart, Henry, and Weakly counties produce the largest quantities. Some tobacco for domestic consumption is grown in Greene, Unicoi, Smith, Trousdale, Macon, Jackson, and Clay counties. Cotton is grown most largely in West Tennessee and especially in the counties of Fayette, Shelby, Hardeman, Haywood, Henderson, Madison, McNairy, Lake, Lauderdale, Tipton, and Weakly. The counties in Middle Tennessee growing the largest quantities are Giles and Rutherford. At the World's Fair, in London, in 1851, the medal for the finest cotton was won by a citizen of Shelby County. The largest corn-growing counties are Gibson, Obion, Carroll, Bedford, Giles, Lincoln, Maury, Weakly, Williamson, and Wilson. The counties producing the largest quantity of wheat are Obion, Williamson, and Maury, each of which produces between 500,000 and 1,000,000 bushels. Bedford also is classed among the wheat-growing counties.

In the counties of West Tennessee, notably in Gibson, Crockett and Madison, truck-farming has become very successful. Tomatoes, Irish potatoes, strawberries, asparagus, apples, plums, peaches and pears are grown for the northern markets. The region around Humboldt has been largely converted into truck and fruit farms. The peanut district is confined to Perry, Hickman, Humphreys, Benton, and Decatur counties. The values of the principal crops for 1899 were:

Corn $28,059,508; wheat, $7,882,697; oats, $887,940; barley, buckwheat and rye together, $84,342; sorghum cane and syrup, $647,129; tobacco, $2,748,495; peanuts, $392,648; peas, $767,840; hay and forage, $6,811,577; cotton fibre and seed, $9,166,688; vegetables, $5,146,592; orchard products, $1,479,915.

Mining.— The coal measures cover 5,100 square miles and are coincident with the Cumberland Table-land. There are from two to six seams of workable coal, all bituminous or semi-bituminous. Much of the coal output is manufactured into coke. The number of coal mines in operation in 1902 was 166 and the total production of coal 4,232,032 short tons, valued at $5,278,921; coke, 555,188 tons, valued at $1,709,745; number of coke ovens 2,227. Three districts in the State produce iron ores: (1) The Eastern district embracing all the counties lying at the western foot of the Unaka Mountains, together with Knox and Sullivan counties; (2) The Chattanooga district, embracing all the counties lying at the eastern foot of the Cumberland Table-land and those in Sequatchie Valley; (3) The Western Iron Belt embracing the counties lying on the Highland Rim east of the Tennessee River, with Maury, Lawrence and Lewis included, and Benton and Decatur counties on the western side of that stream. The ores of the eastern district are magnetite, compact red hematite and limonite; in the Chattanooga district the fossil or stratified Clinton ores; in the Western Iron Belt limonite mainly, with small beds of red ores. Iron ores in workable quantity are found in 44 counties in the State. The carbonate iron ores occur in a stratified bed in Lawrence County, and in nodular balls associated with the shales of the coal measures. There are three large furnaces in the eastern district; nine in the Chattanooga district and nine in the Western iron district, making 21 in the State, all using coke as a fuel, with the exception of two in Stewart County that make cold blast charcoal iron exclusively. The amount of iron made in 1902 was 392,778 tons. The amount of iron ore mined 628,870 long tons. Copper is found only in Polk County. The production for 1902 was 342,554 short tons of copper matte, valued at $541,235. The capacity of the copper furnaces is equal to 10,000,000 pounds of ingot copper annually.

The largest deposits of stratified phosphate rock in the world were discovered in Tennessee in 1894. These cover an area of 75 square miles and the phosphate rocks have a thickness of from three to ten feet in portions of Maury, Hickman, Lewis, Sumner, and other adjoining counties. Much of the rock runs from 75 to 82 per cent of phosphate of lime. There are 25 mines in operation. The production in 1902 was 454,078 long tons, valued at $1,341,161. The gray, the blue and the white are different varieties found in different sections, the white not being stratified.

Zinc ores are mined in Jefferson, Union, and Claiborne counties, and lead in Bradley County. Fluor spar is mined in Smith, Trousdale, and Wilson counties; gold is found in Monroe

County; barytes in McMinn, Monroe and Loudon counties; iron pyrite and manganese in Carter County; lithographic stone in Putnam County; hydraulic rock in Hardin, Wayne, and Decatur counties; roofing slates in the counties lying at the foot of the Unaka Mountains, two quarries being in operation; potter's clay occurs in half the counties of the State, and true kaolin in Henry and Carter counties; several diamonds of purest water were found in Union County. Mineral springs, embracing sulphur, soda, and chalybeate abound in every part of the State. Petroleum, in paying quantity, has been found in Overton, Pickett, and Fentress counties. Red variegated marble is found in nearly all the counties in the Valley of East Tennessee, the best varieties occurring in Hawkins, Jefferson, and Knox; black marble is found in Washington, Greene, Sevier, McMinn, and Polk counties. Tennessee marble has been employed for constructing many public buildings and for the inside embellishment of many others, including the Capitol and Library building in Washington City. There are 34 marble quarries, the output of which, in 1902, was 369,550 cubic feet, valued at $500,550. There are quarries of building stone, of limestone, sandstone, and cement rock of the aggregate value, in 1901, of $35,000. There were mined in 1902 3,255 tons of barytes, value $14,647; lead, 500 tons, value $2,000; zinc blende 54 tons, value $1,620.

Manufactures.— Tennessee had, in 1900, 8,016 manufacturing establishments with a capital of $71,814,038, employing 50,504 persons, with wages aggregating $16,647,638. Grouping these establishments of the State, the figures in the following table will show the numbers and capital employed above $1,000,000.

There are also manufactured, brooms, barrels, candy, cotton-seed products, whiskey, foundry products, ice, lime, mattresses, paints, stoves, wagons, and woodenware in considerable quantities.

	Establishments	Capital
Lumber and its manufactures...	1,940	$16,401,261
Iron and steel and their products	135	9,261,843
Textiles	135	8,163,371
Food and kindred products	1,784	8,031,818
Leather and its finished products	181	4,242,154
Chemicals and fertilizers and allied products	65	4,086,139
Paper and printing	295	3,717,738
Vehicles for land transportation	141	3,127,395
Clay, glass, and stone products	214	1,899,358
Tobacco	92	1,852,511

While the number of establishments has increased, in a half century, less than three-fold, the capital has increased nearly twelve-fold and the products at about the ratio of the capital. The number of employees has increased only four-fold, but the value of the products for each employee was, in 1850, $807; in 1900, $2,141.

Railroads.— The State has 3,291.38 miles of railroads, excluding side tracks and double tracks. The Nashville-Chattanooga and Saint Louis Railway has 876.27 miles in the State; Louisville and Nashville, 528.01; Illinois Central, 266.52; Southern Railroad, 553.41; Tennessee Central, 285.30; Kansas City, 34.34; Cincinnati, New Orleans and Texas Pacific, 137.43; Atlanta, Knoxville & Northern, 108; Nashville and Knoxville, 86.80; East Tennessee and Western North Carolina, 31; Knoxville & Bristol, 39.60; Chesapeake and Nashville, 26.31; Virginia & Southwestern, 53.70; Mobile & Ohio, 119.08; Knoxville and Ohio, 66 miles. (The two roads last mentioned pay a privilege tax and are not taxed ad valorem.) Two or three other lines have a mileage of from 2 to 24 miles. This mileage does not include the electric lines, of which there are many, the principal ones being in Nashville, Memphis, Chattanooga, Knoxville and Clarksville, which connect suburban villages.

Finances.—The bonded debt, interest-bearing, of the State of Tennessee, in 1903, was $15,031,300; $12,363,900 bearing 3 per cent; $1,600,000 bearing 4½ per cent; $400,000 bearing 4 per cent. Bonds held by charitable and educational institutions bear 5 and 6 per cent. The value of railroad, telephone and telegraph property is $60,753,644.00 as assessed for the years 1903–4. The assessed valuation of all other property for the year 1903 was $351,762,769. The State tax is 35 cents on the $100. Ten per cent of the revenue of the State is placed each year in the Sinking Fund for the purpose of retiring bonds. One thousand dollars' worth of personal property is exempt from taxation.

Banks and Banking Institutions.— There were in the State on 9 Sept. 1903, 60 national banks, with an aggregate capital of $7,345,000; individual deposits, $31,095,603.12; surplus fund, $1,975,599.57, and undivided profits, $1,481,042.31. There were also 185 state banks, trust companies, and real estate concerns having an aggregate capital of $7,437,100; deposits, $32,525,611; surplus and undivided profits, $1,948,129.43.

Education.— The permanent school fund of the State invested in certificates of indebtedness is $2,512,000 and yields an annual income of $150,750. In addition to this a recent statute gives to the public schools all money remaining in the State Treasury on January 1st of each year. This will average $250,000. Every county in the State levies a supplemental tax, for the support of schools, varying from 15 cents to 50 cents on the hundred dollars' worth of taxable property. In the public school system there were in the country districts in 1903, 7,747 schools, of which 6,205 were for white pupils and 1,542 for colored. There were also 163 city public schools, supported mainly by municipal taxation. The total number of teachers employed was 9,732, of which 7,777 were white and 1,955 colored. The number of pupils enrolled in the public schools during the year ending 30 June 1903 was 492,776, of which the daily attendance was 342,631. Of these 274,300 were white and 68,331 were colored. The entire scholastic population of the State, between the ages of 6 and 21 years, was 776,041; whites, 583,562; colored, 192,479. The total receipts for the year 1903 from all sources for public school purposes and the amount on hand at the beginning of the year were $3,026,653.54. The total amount expended for school purposes, $2,159,444.30.

There are many institutions for higher education. The principal ones for white students are: The University of Tennessee, Knoxville, with an endowment of $426,000, which is the amount received from the funds appropriated by the United States for agriculture and the mechanic

arts; University of the South, Sewanee (Episcopalian); The Peabody School for teachers, sustained by an appropriation of $20,000 annually from the State and by appropriations from the Peabody Education fund; Vanderbilt University, Nashville (Methodist); Burritt College, Spencer (Disciples); Cumberland University, Lebanon (Cumberland Presbyterians); Hiwassee College (Methodist), Hiwassee; Maryville College (Presbyterian), Maryville; Milligan College (Disciples), Milligan; Southwestern Baptist University, Jackson; Bethel College (Cumberland Presbyterian), McKenzie; Southwestern Presbyterian University, Clarksville; Washington College (Presbyterian), Salem; King College (Presbyterian), Bristol; Grant University (Methodist), Athens; American University, Harriman; Carson and Newman College (Baptist), Jefferson City; Greenville and Tusculum College, Tusculum; Terrell College, Decherd; Winchester Normal College, Winchester.

Watkins Institute for white boys is a night school and liberally endowed by the munificence of two former citizens of Nashville. There are numerous high schools (white) for young ladies. In the city of Nashville are: Ward's Seminary; Belmont, Boscobel, Mrs. Buford and Saint Cecilia. In Memphis, Saint Mary's; Montgomery Bell, Nashville, is a high preparatory school for boys well endowed, and is a part of the University of Nashville now consolidated with the Peabody Teachers' College. The number of white pupils attending these colleges and high schools for the year 1903 was 5,692; number of instructors 505; number of volumes in library 177,365. The higher institutions of learning for the colored population are: Fisk University (Congregational), Roger Williams University (Baptist); Walden University (Northern Methodist), all located in Nashville. Other institutions for the colored are, LeMoyne Normal Institute, Memphis; Knoxville College (colored), Knoxville. The number of colored pupils in these colleges was 2,700; teachers 150; volumes in library 21,774. The State appropriates money in variable amounts for colored normal scholarships, which is distributed to several colleges for the training of colored pupils. The total number of pupils, white and colored, attending colleges and high schools in 1903 was 8,008; number of teachers 644; number of volumes in libraries, 199,139.

Religion.— The Methodist Episcopal Church South is the strongest in churches, membership, Sunday schools, and teachers of any denomination in Tennessee. It has three conferences, namely, Tennessee Conference, which wholly lies in the State of Tennessee; the Holston Conference, two thirds of which is in Tennessee, and the Memphis Conference, two thirds of which is in Tennessee. Basing the calculation upon these facts, the Methodist Episcopal Church South has in Tennessee, 143,818 members, 1,356 Sunday schools, 90,401 pupils, 9,544 teachers. The number of charges, which include from one to ten churches, is 401. The number of societies, 1,584, and one university, Vanderbilt, situated in Nashville, with an endowment of $1,300,000.

The white Baptists have a membership of 130,801, 1,480 churches, 842 Sunday schools, and 48,448 pupils. The colored Baptists have 152 meeting houses, a membership of 55,611, Sunday schools, 312, number of pupils, 13,129. The Cumberland Presbyterians have 571 churches, 41,925 members, and 19,851 pupils in Sunday schools. The Presbyterian Church in the United States (Southern) has 197 churches in the State of Tennessee, 98 ministers, 18,994 communicants, 175 Sunday schools, and 12,077 scholars. The Catholics have 40 churches, with a membership of 30,000, and 3,937 young pupils under Catholic care, one college, six academies for girls, and two orphan asylums. The Episcopalians have 90 churches, 6,731 communicants, 90 Sunday schools with 3,500 pupils, four schools, and one university (white), one industrial, and three day schools (colored). Value of church property about $800,000. There are two orphan asylums supported by the Church. The Christians, or Disciples, have 585 churches and a membership of 65,000. The Hebrews have nine synagogues with about 1,000 members. There are Sabbath schools connected with all the synagogues.

The foregoing statistics of churches and Sunday schools are from official sources for the year 1903. The statistics for other churches in the State are not so recent and the following are as near accurate as can be obtained. The Methodist Episcopal Church (North) has 549 churches, 42,873 members; Primitive Baptist, 288 churches, 12,987 members; African Methodist Episcopal, 52 churches, 12,434 members; Colored Methodist Episcopal, 205 churches, 18,968 members; Lutherans, 20 churches, 1,999 members; Methodist Protestant, 37 churches, 2,889 members; Free Will Baptist, 35 churches, 2,864 members; Presbyterian Church (Northern) 72 churches, 4,399 members. There are no other church organizations in the State that have as many as 1,500 members. Among those having a few members are, the Congregationalists, Dunkards, Friends, Wesleyan Methodist, United Presbyterian, Reformed Presbyterian, and United Brethren of Christ, with a few scattering churches of other denominations.

Charitable Institutions.— The charitable institutions supported by appropriations from the State are three hospitals for the insane, one near Jackson, one near Nashville, and a third near Knoxville; the Tennessee Industrial School near Nashville; Tennessee School for the Blind, in Nashville; School for the Deaf and Dumb, in Knoxville; Confederate Soldiers' Home, in Davidson County. There are numerous other benevolent institutions, maintained by the voluntary contributions of individuals or by organized societies, such as the Masonic Home near Nashville, the Odd Fellows Orphans' Home at Clarksville, Old Woman's Home in Nashville. The County Asylum of Davidson County erected at a cost of $300,000 and supported by the county, is a noble benefaction for the care of the indigent. There are several institutions supported by the various churches, and 89 asylums supported by the counties.

Penal Institutions.— Tennessee expended between 1893 and 1897, $588,000 in building a state prison near Nashville and a branch prison in Morgan County, where 762 convicts, able-bodied and serving for long terms, are employed in the mining of coal. A portion of the money was spent in buying coal land, about 11,000 acres. At the mines there are about 140 coke ovens, and all

equipments for mining coal. There are 93 county jails in the State.

Political Divisions.— Tennessee has 96 counties which are grouped into three civil or political subdivisions: (1) East Tennessee that extends from the North Carolina line to the centre of the Cumberland Table-land and embraces the first and second natural divisions and half of the third. Its area is 13,112 square miles and it contains 34 counties. (2) Middle Tennessee extends from the centre of the Cumberland Table-land westwardly to the Tennessee River and embraces the whole of the fourth and fifth natural divisions and one half of the third and sixth. It contains 18,126 square miles and has 41 counties. (3) West Tennessee extends from the Tennessee River westwardly to the Mississippi River and embraces the seventh and eighth natural divisions and one half of the sixth. It contains 10,812 square miles and 21 counties. There are 10 congressional districts in the State.

State Government.— The present State Constitution was adopted in 1870, and among other clauses not contained in the Constitutions of 1796 and 1834 was one inhibiting the State from appropriating money for internal improvement. The governor is elected for two years and receives a salary of $4,000 per annum. The state house officials are: the secretary of state, salary $3,000; the comptroller, salary $3,975; the treasurer, salary, $3,500; insurance commissioner and building and loan inspector (consolidated with the treasurer's office), $1,500; the attorney-general, $3,000; adjutant-general, $1,800; secretary of the funding board, $1,500; secretary of the board of health, $2,000; superintendent of public instruction, $2,000; State librarian, $1,000; commissioner of agriculture, $2,500; commissioner of labor, $1,800; superintendent of the Capitol, $900; three prison commissioners, $2,500 each; three railroad commissioners, $2,000 each; and a board of pensions. The supreme court consists of a chief justice and four associate justices, $3,500 each. There are 10 chancery courts and 1 of chancery appeals; 16 circuit courts with criminal jurisdiction and 3 criminal courts having criminal jurisdiction only. An appropriation of $200,000 per annum is made for disabled soldiers, which is distributed by the pension commissioners.

Population.— The native white persons of native parentage, in 1890, numbered 1,283,481; in 1900, 1,522,600. The percentage of white to the whole population in 1880 was 75.6; colored 24.4; in 1900, white 76.2 per cent; colored 23.8 per cent. The percentage of persons born in the United States was 99.1 per cent; born in foreign lands .9 per cent. The urban population in 1890 was 202,337; in 1900, 269,918. There were born in Tennessee, living in other States, in 1900, 566,405. Of the 104 incorporated towns in Tennessee, reported in the census of 1900, Memphis had a population of 102,320; Nashville, the capital, 80,865; Knoxville, 32,637; Chattanooga, 30,154. There were 23 other towns having a population between 2,000 and 15,000, Jackson, Clarksville, and Columbia being the largest.

History.— In 1754 a small colony from North Carolina settled in the territory of what is now Tennessee, but it was soon driven out by the Indians. Three years afterward there was another settlement at Fort Loudon, on the Little Tennessee River, 30 miles from Knoxville. In 1760, the Indians captured the fort and the whites surrendered on condition that they be allowed to return to North Carolina, but they were butchered the second day. After the treaty of peace was made between England and France, in 1763, the restless spirit of adventure led many from North Carolina and Virginia to return to the district, about which there was a charm they could not resist. Settlements were made on the Watauga and Holston rivers in 1769, 1771, and 1772, called the Watauga Association. The settlers composing this association were the founders of the commonwealth of Tennessee, and as early as 1772 they decided to establish some kind of government for the protection of the colony and to dispense justice among themselves. John Sevier and James Robertson were the leaders. They were the first men of American birth, says Roosevelt, to establish a free and independent community on the continent. According to him, they outlined, in advance, the nation's work; they tamed the rugged and shaggy wilderness; they bade defiance to all foes, and successfully solved the difficult problem of self-government. In 1776 the territory was represented in the Colonial Assembly of North Carolina and the region was officially called the District of Washington, the first spot in America named in honor of Washington. In 1777 Washington District became Washington County and embraced the whole of the present State of Tennessee. In 1784 the State of Franklin was formed by the discontented settlers and it maintained its organization until 1788, with John Sevier as governor, when it was dissolved and the jurisdiction of North Carolina was again acknowledged and re-established. North Carolina ceded the territory of what is now Tennessee, to the General Government 25 Feb. 1790, and it was accepted by Congress April 2. The region embraced in the cession was called "The Territory of the United States South of the River Ohio." William Blount was appointed by President Washington, governor of this territory, 8 June 1790. On 1 June 1796 Tennessee was admitted into the Union and was the first State carved out of territory belonging to the United States. Vermont and Kentucky had been previously admitted, but the territory, from which they were formed, belonged to States and not to the General Government. The Watauga colonists took an active part in the Revolutionary War, and with other mountaineers won a brilliant victory at King's Mountain, South Carolina, within one and a half miles of the North Carolina line, 7 Oct. 1780, destroying the left wing of Cornwallis' army, which was the turning of the tide in favor of the colonies. Another settlement west of the Alleghany Mountains was established in 1780, on the Cumberland River where Nashville now stands. James Robertson who had spent 10 years in the Watauga settlement, was the prime mover in the Cumberland settlements. For many years the colonists at this new settlement endured the greatest privations and were subjected to ceaseless perils from the warlike tribes of Indians that surrounded them. It has been well said that their remote inland position exempted them from much of the malign influence of the emissaries of England and France during the Revolutionary period, but their exposure to Spanish and Indian jeal-

ousy and hatred, combined, was greater than that endured by any other portion of the country. In 1784 there were but four counties in the territory now embraced in the State of Tennessee, Washington, Sullivan, and Greene, which belonged to the Watauga settlement, and Davidson County, the only one west of the Cumberland Mountains. It was organized in 1783.

Tennessee soldiers have always taken a prominent part in every war since the State was admitted into the Union. In the second war with Great Britain, Tennessee furnished 27,833 soldiers. Under Gen. Jackson, Tennesseeans waged a successful war against the Creek Indians who were punished severely for the great massacre they committed at Fort Mims. The same soldiers under the same general captured Florida and won the most complete land victory over the British, at New Orleans, 8 January 1815, ever recorded in history, destroying the army of Pakenham that was composed of veterans of the Napoleonic wars. They bore an active part in the Seminole War, in 1836. In 1847 the volunteers of Tennessee in the war with Mexico, won, by their valor and endurance, imperishable honors at Vera Cruz and Chapultepec. Though the requisition on Tennessee by the War Department called for three regiments, numbering in all 2,800 men, yet 30,000 volunteers tendered their services, and in doing this, won for Tennessee the name of "The Volunteer State." Tennessee seceded from the Union 8 June 1861, and Acts were passed by the Legislature to raise and equip 55,000 men and an appropriation of $5,000,000 was made for its defense. The State was divided against itself. The eastern portion favored the adhesion to the Union and the middle and western portions sympathized with the Southern Confederacy. The provisional army of Tennessee was transferred to the Confederacy, 31 July 1861. After this, Tennessee became the battleground of the Civil War; 454 engagements, skirmishes, etc., took place on its soil. Among the most notable battles were Fort Pillow, Fort Henry, Fort Donelson, Shiloh, Murfreesboro, Chickamauga, Chattanooga, Lookout Mountain, Missionary Ridge, Franklin, and Nashville. The greatest battle of the West was that fought on the soil of Georgia and Tennessee at Chickamauga. On the part of the Confederates, the main body was composed of the flower of the Tennessee troops who fought desperately with the hope of recovering their homes.

Tennessee furnished during the Civil War, 115,000 troops to the Confederate government, and 31,092 to the Federal government, besides 20,000 negro soldiers that were credited, in part, to many other States. During the recent Spanish War, Tennessee responded readily to the call of the President and supplied its quota of troops. Slavery was abolished in the State, by vote, on 22 Feb. 1865. In the Civil Department of the General Government, Tennessee has made an enviable record. It has furnished three Presidents — Andrew Jackson, James K. Polk, and Andrew Johnson; two justices of the Supreme Court, John Catron and Howell E. Jackson; two Speakers of the House of Representatives, John Bell and James K. Polk; 11 cabinet officers, Geo. W. Campbell, secretary of the treasury, John H. Eaton, and John Bell, secretaries of war; Felix Grundy, attorney-general; Cave Johnson, Aaron V. Brown, David M. Key, and Horace Maynard, postmasters-general. It has also furnished two ministers to Russia, two to Turkey, two to Chile, one to Spain, one to Prussia, one to Brazil, one to Bolivia, and one to Venezuela, besides a governor-general to the Philippine Islands, Luke E. Wright. Tennessee has had three constitutional conventions, one in 1796, presided over by William Blount, territorial governor; one in 1834, presided over by Wm. B. Carter; one in 1870, presided over by John Calvin Brown.

Tennesseeans have always been distinguished for their breadth of views and tolerance of opinions. They are brave, patriotic, self-reliant, energetic, public-spirited and law-abiding, and they sympathize with learning and progressive thought. A State that has nurtured a Jackson, a Houston, a Farragut and a Forrest, may well boast of its ideals. The first abolition paper in the United States was published in Tennessee. It was the last State that seceded in the Civil War and only did so when called upon to turn its arms against its kindred. The opinions of North and South, like the productions, overlap and commingle in Tennessee. The conservatism of its citizens is ingrained, strong, decided and permanent. There have been one territorial, one military, and 27 State governors.

Bibliography.— Roosevelt, 'The Winning of the West'; Safford, 'Geology of Tennessee'; Killebrew, 'The Resources of Tennessee'; Histories of Tennessee by Haywood, Phelan, Garrett and Goodpasture, and McGee; Porter, 'The Military History of Tennessee'; Ramsey, 'Annals of Tennessee'; Safford and Killebrew, 'Geology of Tennessee'; Mineral Resources by the Geological Survey of the United States; Clayton, 'History of Davidson County'; Allison, 'Statistical and Historical Map'; Safford and Killebrew, 'Geological Map of Tennessee'; Parton, 'Life of Andrew Jackson'; Official Publications of the State of Tennessee.

J. B. Killebrew, A.M., Ph.D.,
Author; Commissioner of Agriculture, Statistics and Mines, State of Tennessee, 1871–1881.

Tennessee, a river formed by the Holston from Virginia and the French Broad from North Carolina, which unite near Knoxville, Tenn. It flows southwest, entering Alabama in the northeastern part of the State, and continuing southwest to the centre of Marshall County, where it turns northwest and flows across the northern part of Alabama, re-entering Tennessee in Hardin County. From here the course of the river is nearly due north across the State of Tennessee and the western part of Kentucky, to the Ohio River, which it enters at Paducah, Ky. The length of the river is about 800 miles; from the source of the Holston to the mouth of the Tennessee is about 1,200 miles. It is navigable, without artificial aid, to Florence, in Lauderdale County, Ala., a distance of 280 miles from Paducah. Just above Florence are the Muscle Shoals, about 20 miles long, which are navigable for about one month in the spring. A canal has been built to overcome this obstruction to navigation. Above the Shoals, the river is navigable for light-draft steamers nearly all the year. The navigable waters of the upper course of the river, together with the Holston, are about 930 miles. The Tennessee is the largest tributary of the Ohio River. It enters the Ohio 10 miles from the mouth of the Cumberland River.

Tennessee, Army of the, one of the divisions of the Federal Army in the Civil War. After the battle of Shiloh (q.v.) it was commanded by Gen. Halleck, and later by Grant, Sherman and others.

Tennessee, University of, the State University located at Knoxville, Tenn. It was established in 1794 as Blount College, a non-sectarian institution, and was incorporated by the first general assembly of the territory southwest of the Ohio; in 1807 the name was changed to East Tennessee College, and in 1809 to East Tennessee University. In 1869 the State legislature gave to the University the control of the Congressional land grant of 1862; in 1879 it was further recognized as a State institution by an act connecting it with the public schools of the State; and in that year its name was changed to the University of Tennessee. The board of trustees consists of 30 members nominated by the board and elected by the legislature for life, from each Congressional district; the governor, the secretary of state and superintendent of public instruction are members *ex officio*. The University is coeducational. It comprises the College of Agriculture and Mechanic Arts and the University Department; the former includes (1) the Agricultural Department with a four years' course in agriculture, animal husbandry, dairying, horticulture and forestry, meteorology and general sciences; (2) the Engineering Department with four years' courses in mechanical, civil, and electrical engineering and chemistry; (3) the Literary Department with courses in languages and literature, general sciences, history and political economy; (4) the Department of Education with courses in pedagogy and methods of teaching English, history, manual training and other special subjects; (5) an Industrial Department in Knoxville College for colored students, with courses in agriculture, carpentering, printing, brick-making, sewing, cooking, and electrical work. The university includes (1) the Academic Department and Department of Education, with two-year graduate courses leading to the degrees of A.M. and M.S., and professional courses leading to the degrees of mechanical engineer, electrical engineer, and civil engineer; (2) the Department of Law, with a two years' professional course leading to the degree of LL.B.; (3) the Department of Medicine, with a four years' course leading to the degree of M.D.; (4) the Department of Dentistry, with a course leading to the degrees of D.D.S. The last two departments are located at Nashville, Tenn. The Literary Department confers the degree of A.B. for the completion of a course including the full course in Latin or Greek; for other courses the degree of B.S. is conferred; the Agricultural Department and the Engineering Department confer the degree of B.S. in agricultural science, in civil engineering, in mechanical engineering, etc. Students in the Department of Education are admitted to courses in the other college departments and on the completion of a four years' course receive the degree of A.B. or B.S., according as they do or do not complete Latin or Greek. Military science and drill are a part of the curriculum and are required of the men students in the Freshmen and Sophomore classes. In 1902 a teachers' summer school was opened on the university grounds with the cooperation of the university authorities. (See SUMMER SCHOOL OF THE SOUTH.) Short winter courses are given in the Agricultural Department; and this department organizes farmers' institutes throughout the State; the State agricultural experiment station is also connected with the university. The campus proper contains 37 acres, and the university farm contains 105 acres; in 1904 there were 16 buildings including dormitories on the campus. The productive funds in 1904 amounted to $425,000; the annual income to $104,216; the library contained 17,600 volumes. The students numbered 756, and the faculty 120.

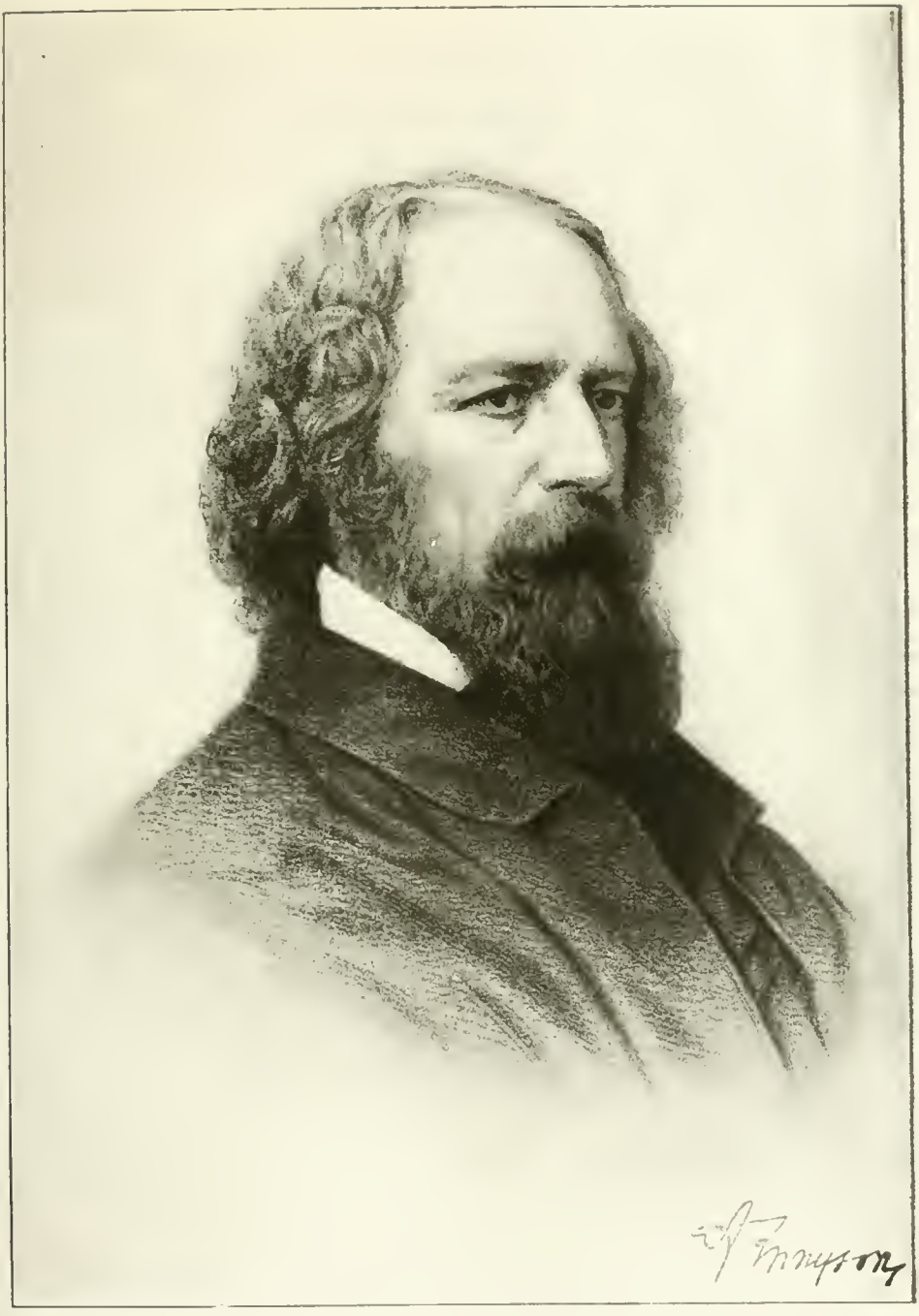
Tenniel, tĕn-nēl', SIR **John,** English artist: b. London 1820. He received no regular art training. In 1845 he was selected by open competition to paint a fresco in the Houses of Parliament at Westminster, but he is better known as a book-illustrator and a cartoonist in 'Punch,' on whose staff he worked during the 50 years 1851–1901. His cartoons are unique as contributions to a comic paper, being of classic severity in line and expression and often tinged with a tragic seriousness of meaning which exhibits their author as not only a great caricaturist but also a great painter. Yet nothing can be more powerful than the political satire which characterizes the majority of them, a satire whose geniality neither deadens the life nor blunts the point of their irresistible humor.

Tennis. See LAWN TENNIS; RACKETS.

Tennyson, Alfred, LORD, English poet: b. Somersby, Lincolnshire, 6 Aug. 1809; d. Aldworth, near Haslemere, on the border of Sussex and Surrey, 6 Oct. 1892. His boyhood was passed at his father's country rectory, in an atmosphere that was full of poetry and music; and at a very early age he began to try his wings in verse. Some of his youthful efforts were published in partnership with his elder brother Charles, in 1827, in a volume entitled 'Poems by Two Brothers.' Two years later he entered Trinity College, Cambridge, and became a member of an intimate society called 'The Apostles,' which included some of the most brilliant young men in England. Among them was Arthur Henry Hallam, the closest friend of Tennyson. In 1829 he won the Chancellor's Medal with a poem in blank-verse called 'Timbuctoo'; and in the following year he published 'Poems, Chiefly Lyrical,' a slender volume of new and delicate melodies. Soon after his father's death in 1831, he left college without taking his degree; and for the 60 years that followed he gave himself to a poet's life with a clear resolution which never wavered.

His volume of poems published in 1832 marked a distinct growth in strength and skill. It was but a tiny book; but there was a quality in it which more than balanced the lack of quantity. 'The Lady of Shalott,' 'Œnone,' 'The Lotos-Eaters,' 'The Palace of Art,' and 'A Dream of Fair Women,' revealed the presence of a true dreamer of dreams, gifted with the magic which translates visions into music. 'The Miller's Daughter,' 'The May Queen,' and 'New Year's Eve,' showed the touch of one who felt the charm of English rural scenery and common life with a sentiment so fresh and pure and deep that he might soon be able to lay his hand upon the very heart of the people.

But before this highest potency of the poet's gift could come to Tennyson, there was need of a baptism of conflict and sorrow, to purify him from the mere love of art for art's sake, to save



ALFRED TENNYSON.

him from becoming an over-dainty weaver of exquisite verse, and to consecrate his genius to the severe and noble service of humanity and truth. This liberating and uplifting experience was enfolded in the profound grief which fell upon him in Arthur Hallam's sudden death at Vienna, in 1833. How deeply this irretrievable loss shook the poet's heart, how closely and how strenuously it forced him to face the mystery and the meaning of life in lonely spiritual wrestling, was fully disclosed, after 17 years, in the famous elegy, 'In Memoriam.' But the traces of the conflict and some of its fine results were seen even earlier, in the two volumes of 'Poems' which appeared in 1842, as the fruitage of a decade of silence. 'Ulysses,' 'Morte d'Arthur,' 'St. Simeon Stylites,' 'Dora,' 'Locksley Hall,' 'A Vision of Sin,' 'The Two Voices,' and that immortal lyric, 'Break, Break, Break,' were not the work of

"An idle singer of an empty day."

A new soul had entered into his poetry. His Muse had been born again, from above. He took his place with the master-minstrels who sing with a full voice out of a full heart, not for a coterie, but for the age and for the race.

It was the recognition that Tennyson really belonged to this higher class of poets,—a recognition which at first was confined to a clear-sighted circle, but spread by degrees to the wider reading public,—that prepared an expectant audience for his first long poem, 'The Princess,' which appeared in 1847. The subject was the eternal "woman question," treated in the form of an epic, half heroic and half humorous; the story of a king's daughter who sought to emancipate (and even to separate) her sex from man, by founding a wonderful woman's college, but was conquered at last, (or at least modified,) by the love of an amorous, chivalrous, dreamy prince, who wooed and married her. The blank verse in which the tale is told has great beauty, though it is often too ornate. The conclusion of the poem is a superb tribute to the honor of "das ewig weibliche." But the little interludes of song which are scattered through the epic shine as the chief jewels in a setting which is not all of pure gold.

In 1850 the long-delayed and nobly-labored elegy on the death of Hallam was given to the world. It is hardly too much to say that 'In Memoriam' stands out, in present vision, as the most illustrious poem of the 19th century. Certainly it has been the most frequently translated, the most widely quoted, and the most deeply loved. It is far more than a splendid monument to the memory of a friend. It is an utterance of the imperishable hopes and aspirations of the human soul passing through the valley of the shadow of death. It is a unique group of lyrics, finished with an exquisite artist's care, which is only surpassed by the intense and steady passion which fuses them into a single poem. It is the English classic on the love of immortality and the immortality of love.

In the same year with the appearance of this poem happened the two most important events of Tennyson's career. He was married in June to Miss Emily Sellwood, a lady of rare and beautiful endowments, who proved herself through a long life of unselfish devotion the true partner of a poet's existence. And he was appointed in November to succeed Wordsworth as poet laureate.

His first official poem was the stately 'Ode on the Death of the Duke of Wellington,' in 1852. The majestic march of the verse, its freedom, its organ-toned music, its patriotic vigor, and the lofty solemnity with which it closes, give it a higher place than can be claimed for any other poetical production of an English laureate for a public occasion. 'The Charge of the Light Brigade,' written in 1854, was a trumpet-note that rang through England and echoed around the world.

'Maud' was published in 1855. It is a lyrical monodrama, in which the hero, a sensitive and morbid man, with a hereditary tendency to madness, tells the story of his redemption from misanthropy and despair by the power of a pure love, unhappy but victorious. The variety of the metrical forms in this poem, the passionate tenderness of the love songs, the beautiful truth of the descriptive passages, and the intense personality of its spirit, give it a singular charm, which is felt most deeply perhaps by those who are young and in love. Tennyson himself said to me, "I think 'Maud' is one of my most original poems."

In 1859 began the publication of the epical sequence called the 'Idylls of the King'; the largest, and in some respects the most important, of the works of Tennyson. The first group contained 'Enid,' 'Vivien,' 'Elaine,' and 'Guinevere.' The second group appeared in 1870, and consisted of 'The Coming of Arthur,' 'The Holy Grail,' 'Pelleas and Ettare,' and 'The Passing of Arthur.' In 1872 'Gareth and Lynette' and 'The Last Tournament' were published; and in 1885 'Balin and Balan' was printed in the volume entitled 'Tiresias and Other Poems.' The division of 'Enid' into two parts — 'The Marriage of Geraint' and 'Geraint and Enid' — makes the epic, as it now stands, consist of 12 idylls. Each of these clothes an ancient legend from the Arthurian Cycle in the richest and most harmonious of modern blank verse. The idylls are so far independent that any one of them might stand alone as a complete poem. But there is a connecting thread running through them all in the threefold love-story of Arthur, Guinevere, and Lancelot, and in the history of the Round Table. The underlying motive of the whole series is to shadow forth the war of Sense against Soul. The idylls are to be interpreted therefore as movements in a symphony, the theme of which is the rightful royalty of man's spiritual nature, seeking to establish itself in a settled reign of law, and constantly opposed by the disorderly and disintegrating elements of humanity. In 'The Coming of Arthur' it is doubt that threatens the kingdom; in 'Gareth and Lynette' the conflict is with false ambition; in 'The Marriage of Geraint,' with pride; in 'Geraint and Enid,' with jealousy; in 'Balin and Balan,' with suspicion; in 'Merlin and Vivien,' with lust; in 'The Holy Grail,' with superstition; until at last the poison of unlawful love has crept through all the court, and Arthur's Round Table is dissolved in ruin,—but not without a vision of peace for the king who has kept his soul unstained, and a dim promise of new hope for some future age, when he shall return to bloodless victory.

Tennyson has not allowed the ethical purpose of these poems to confuse their interest or bedim

their beauty. They are not in any sense an allegory. The tales of love and knight-errantry, of tournament and battle and quest, are vividly told in the true romantic spirit, lighting up the olden story with the thoughts and feelings of to-day. There is perhaps a touch of over-elaborateness in the style; but after all the figures stand out as distinctly as they ought to do in such a large tapestry. In the finer idylls, like 'Guinevere' and 'The Passing of Arthur,' the blank verse moves with a grandeur and dignity, a broad, measured, fluent harmony, unrivaled in England since Milton's organ voice was stilled.

The rest of Tennyson's poetical work includes his dramas, — 'Queen Mary,' 'Harold,' 'Becket,' 'The Cup and the Falcon,' and a few others,— and several volumes of miscellaneous poems: 'Enoch Arden' (1864), 'The Lover's Tale' (1879), 'Ballads' (1880), 'Tiresias' (1885), 'Locksley Hall Sixty Years After' (1886), 'Demeter' (1889), and 'The Death of Œnone,' published posthumously in 1892. The great age to which his life was prolonged, the unswerving fidelity with which he devoted himself to the sole pursuit of his chosen art, the freshness of spirit which made him delight in labor to the very last, and the fine versatility of mind with which he turned from one field of production to another,— brought it to pass that both in amount and in variety of work, Tennyson stands in the front rank of English poets. I can think of but two — Shakespeare and Robert Browning — who produced more.

In 1883 a title of nobility was offered to Tennyson through Mr. Gladstone. This honor, which he had declined at least once before, he now accepted; and in January 1884 he was admitted (we can hardly say elevated) to the peerage,— taking his title, Baron of Aldworth and Farringford, from his two country houses, in Sussex and in the Isle of Wight.

It would be difficult, of course, to characterize the style and estimate the value of such a varied and fertile poet in a brief essay. But there are certain qualities in the poetry of Tennyson which are unmistakable and vital.

1. His diction is singularly lucid, smooth, and melodious. He avoids sharp and strident effects. Not only in his choice of metres, but also in his choice of words and cadences, we feel a musical influence controlling his verse. Sometimes this results in a loss of force or definiteness. But it makes his poetry, whether in the long swinging lines of 'Locksley Hall,' or in the brief simple measures of the shorter songs, eminently readable. Any one who recites it aloud will find how natural it is to fall, as Tennyson always did, into a rhythmical tone, almost like chanting. This close relation of his poetry to music may be felt also in the quality of subtle suggestiveness, of intimate and indefinable charm, which makes his brief lyrics as perfect as anything of their kind in the world's literature. He has the power of expressing the vague, delicate, yet potent emotions, the feelings that belong to the twilight of the heart, where the glow of love and the shadow of regret are mingled, in verbal melodies as simple and as magical as the chime of far-off bells, or the echoes of a bugle-call dying among the hills.

2. He has an extraordinary truthfulness and delicacy of touch in natural description. This appears equally in minute, pre-Raphaelite work, where he speaks of the color of the buds on different trees in early spring, or of the way in which a wave-crest is reflected in the smooth hollow before it breaks; and in wide, vague landscapes, where he renders the turbulence of the coming storm, or the still glory of an autumnal morning, in a few broad lines. Add to this the quality of blending and interfusing all his epithets and descriptions with the sentiment of the poem, so that they do not distract the feeling but enhance and deepen it, and you have one of the traits by which the poetry of Tennyson is most easily distinguished.

3. His range of imaginative sympathy, as shown in his ballads and character pieces, is very wide; but it moves for the most part along natural and normal rather than strange and eccentric lines. His dramatic lyrics differ in this respect from those of Browning. Tennyson expresses the feeling of the philosopher in 'Lucretius,' of the peasant in 'Rizpah,' of the child in 'The Children's Hospital,' of the old sea-fighter in 'The Revenge,' of the intellectual adventurer in 'Ulysses,' in order to bring out in each, not that which is exceptional and rare, but that which is most deeply human and typical.

4. His work reflects with singular fidelity the scientific and social movements of the age. The discoveries and inventions of modern times are translated into poetic language, and turned to poetic use. In his verse the earth moves, the planets are molded of star-dust, and the mystery of an unfinished creation is still in evolution. It is possible, often, to assign dates to his poems by an allusion to some newly-seen moon or comet, or some critical event in the social history of mankind. It is true that he mistrusts many of the new devices to bring in the millennium. He takes a dark view of some of the elements of 19th-century civilization. But still he feels the forward movement of the world; and his poetry mirrors truly the spirit of modern optimism, — with shadows.

5. As in its form, so in its spirit, the verse of Tennyson expresses a constant and controlling sense of law and order. He is in the opposite camp from the poets of revolt. Harmony is essential to his conception of beauty. His patriotism is sober, steadfast, thoughtful, law-abiding. His love moves within the bounds of order, purity, and reverence. His conception of power is never akin to blind force, but carries within itself the higher elements of intelligence and voluntary restraint.

> Self-reverence, self-knowledge, self-control,—
> These three alone lead life to sovereign power.

6. The poetry of Tennyson is pervaded by a profoundly religious spirit. His view of the world — his view even of the smallest flower that blossoms in the world — is illuminated through and through by his faith in the Divine presence and goodness and beauty. He cannot conceive of a purely physical universe. Nothing that he has written could have been written as it is, if he had been an atheist or an agnostic. Even his poems of doubt and conflict are the resurgent protests of the heart against the cold negations which destroy personal trust in the unseen God, in whom we live and move and have our being. His method in dealing with religious subjects is not theological, like that of Milton or Wordsworth; nor philosophical, like that of Browning or Arnold or Clough. Tennyson speaks more from the side of the feelings, the

ultimate spiritual instincts and cravings of humanity. The strongest of these is the desire and hope of a life beyond the grave. To this passion for immortality he gives full play, and it evokes some of the strongest and sweetest tones of his music. From 'The Deserted House' to 'Crossing the Bar,' his poetry is an evidence of his conviction that death cannot end all. This faith in the life that is to come elevates and purifies his conception of the life that now is. It gives a new meaning to duty and to love. And when we think of the many noble poems in which it has found expression,— 'The Two Voices,' 'The May Queen,' 'Locksley Hall,' 'Enoch Arden,' 'The Leper's Bride,' 'Guinevere,' 'In Memoriam,' 'Vastness,' 'Wages,' — we may well call Tennyson the poet of the endless life.

His influence upon the thought and feeling of the age has been far-reaching and potent. He has stood among the doubts and confusions of these latter days, as a witness for the things that are invisible and eternal,— the things that men may forget if they will, but if they forget them, their hearts wither and the springs of poesy run dry. His verse has brought new cheer and courage to the youth of to-day who would fain defend their spiritual heritage against the invasions of materialism. In the vital conflict for the enlargement of faith to embrace the real results of science, he stood forth as a leader. In the great silent reaction of our age from the desperate solitude of a consistent skepticism, his voice was a clear-toned bell, calling the unwilling exiles of belief to turn again. And when he passed away from his quiet home at Aldworth, with the moonlight falling on closed eyes and voiceless lips, the world mourned for him as for a mighty prophet, and rejoiced for him as a poet who had finished his course and kept the faith.

Bibliography.— Brightwell, 'Tennyson Concordance' (1869); Genung, 'Tennyson's In Memoriam' (1884); Stedman, 'Victorian Poets' (revised ed. 1887); Van Dyke, 'The Poetry of Tennyson' (1889); Napier, 'Homes and Haunts of Tennyson' (1892); Jacobs, 'Tennyson and In Memoriam' (1892); Ritchie, 'Records of Tennyson, Ruskin and Browning' (1893); Littledale, 'Essays on Tennyson's Idylls of the King' (1893); Stopford Brooke, 'Tennyson: his Art and Relation to Modern Life' (1894); Maccullum, 'Tennyson's Idylls of the King and the Arthurian Story' (1894); Jones, 'The Growth of the Idylls of the King' (1895); Sheppard, 'Tennyson Bibliography' (1896); Hallam Tennyson, 'Alfred, Lord Tennyson: a Memoir' (1898); King, 'A Critical Study of In Memoriam' (1898); F. Harrison, 'Tennyson, Ruskin and Mill' (1899); Rawnsley, 'Memories of the Tennysons' (1900); Sneath, 'The Mind of Tennyson' (1900); Masterman, 'Tennyson as a Religious Teacher' (1900); Collins, 'The Early Poems of Tennyson' (1900); Bradley, 'Commentary on In Memoriam' (1901); Lyall, 'Tennyson' in 'English Men of Letters Series' (1902). Annotated editions of Tennyson: 'The Farringford Edition,' by Eugene Parsons; 'The Cambridge Edition,' by W. J. Rolfe; 'The Athenæum Press Edition' (select poems), by Henry Van Dyke and D. L. Chambers (1903). HENRY VAN DYKE,

Professor of English Literature, Princeton University.

Tennyson, Frederick, English poet: b. Louth 5 June 1807; d. Kensington 26 Feb. 1898. He was elder brother of Alfred Tennyson (q.v.). He published several volumes of poems of considerable merit, namely: 'Days and Hours' (1854); 'The Isles of Greece' (1890); 'Daphne and Other Poems' (1891); and 'Poems of the Day and Year' (1895).

Tennyson-Tur'ner, Charles, English poet: b. Somersby, Lincolnshire, 4 July 1808; d. Cheltenham 25 April 1879. He was an elder brother of Alfred Tennyson (q.v.), with whom he collaborated in the 'Poems' of 1827. He took the additional name of Turner by royal license on succeeding to property at the death of a great-uncle. He became vicar of Grasby, Lincolnshire, in 1837, and published 'Sonnets' (1864); 'Small Tableaux' (1868); and 'Sonnets, Lyrics, and Translations' (1873). In 1880 these were republished with additions, under the title 'Collected Sonnets, Old and New.' These writings manifest that he possessed much poetic genius. His greater brother regarded some of his sonnets as among the finest in the language, among them being 'The Rookery'; 'Letty's Globe'; 'Orion'; and 'The Lion's Skeleton.'

Tenochtitlan, tĕn-ōch-tēt-lān', the ancient name of the City of Mexico. See MEXICO.

Tenor, the highest variety of the natural adult male voice. Its compass generally extends from C in the bass to G or A in the treble. Professional singers may take from C to C. The qualities of the tenor render it suitable to the expression of tender and delicate sentiments. In a vocal composition of four parts the tenor forms the second middle part, deeper than the alto, but higher than the bass; but in the song of four male voices the tenor, as the first voice, leads the chief melody, and as the second is the higher middle voice. The clef of this voice is the C clef on the fourth line of the stave, but the treble or G clef is commonly used, though an octave too high. See VOICE AND VOICE CULTURE.

Ten'orite, the native black oxide of copper, CuO. It occurs on the lavas of Vesuvius in small black scales of brilliant metallic lustre. Melaconite is an earthy, massive variety, resembling wad, formed by the decomposition of chalcopyrite and other copper ores. It occurs at Ducktown, Tennessee; Morenci, Arizona, and elsewhere.

Tenos, tē'nŏs, Greece. See TINOS.

Ten'sas, a river in the southeastern part of Alabama, the eastern channel through which the united waters of the Tombigbee and the Alabama rivers pass to Mobile Bay. The western channel is called Mobile River (q.v.). At the mouth of the Tensas is Fort Blakely where took place an engagement between the Union forces and the Confederates, 25 March 1865. See FORT BLAKELY, SIEGE AND CAPTURE OF.

Tenskwa'tawa. See TECUMSEH.

Tent, a portable dwelling-place, formed usually in the simplest manner, of canvas, stretched with cords on poles. Tents are chiefly used in Europe and the United States as shelters for soldiers, although the first hunters in this country, following the Indians, made partial use of them. But since 1860 many people who have

good houses with every comfort desert them in the summer-time, and pitch their tents on the edges of lakes and streams or upon the mountains. The Adirondacks are filled with them in the summer-time, and they are in great abundance on the shores of the minor lakes of New York, Wisconsin, and Minnesota. Awnings became common here first in the South, and have moved farther north since 1860. Originally they were introduced into Europe by the way of Spain, when the Mohammedans penetrated that country.

Tent-caterpillars, caterpillars of some moth of the genus *Clisiocampa,* specifically the apple-tree or spring species (*C. americana*) of the northeastern States. The moth is of medium size and plain colors. Its eggs are laid in autumn in the form of bands of 300 to 400 glued about the twigs of fruit-trees. They hatch early in spring, and the caterpillars begin to spin across nearby forking twigs a triangular silken web or tent, in which they take shelter and grow; many other trees as well as those of the orchard are affected. They go out in the day time to feed on foliage and at night gather inside the web, which should be burned at night when it is populous, or destroyed by a spray of kerosene. The caterpillars become full grown in June, and then are about two inches long, hairy, with a white dorsal stripe and with numerous fine crinkled black lines on a yellow ground, united below into a common black band, with a blue spot on the side of each ring. Then the caterpillars spin their dense white fuzzy cocoons behind loose bark, or boards, and the moths appear about July 1. Another species, often very destructive to the foliage of shade-trees is the forest tent-caterpillar moth (*C. disstria*), whose caterpillars are to be distinguished by a row of spots instead of a line along the back. The more common tent-caterpillars of the Pacific coast are the larvæ of the early *C. californica* and of the later *C. constricta,* both orchard-pests. The last-named live in colonies but do not make tents.

Tentaculif'era, a sub-class of the *Infusoria* having no cilia in the adult condition but provided with them during the embryonic period. The distinguishing feature of the group is found in the so-called tentacles which are very highly differentiated organs, some adapted for sucking and some for piercing, while some again are adhesive. They are emitted from the entire surface of the body or occur in groups at the angles. Such tentacles are elongate, capable of protrusion and retraction, and usually have the distal end expanded into a sucker. In structure a tentacle is tubular with a semifluid plasm in the axis and a firm outer portion. When partly retracted a band of contractile protoplasm appears as a spiral ridge around the outside. There are several branching forms such as *Dendrocometes,* sessile on the gill plates of small freshwater crustacea, and *Dendrosoma,* a larger colony, attaining sometimes a length of 2 mm. and presenting superficially an extraordinary resemblance to a zoophyte. In the latter the nucleus extends as an axial structure branching throughout the entire colony. Young forms are produced by division or gemmation, and are free-swimming by virtue of a ciliary covering which is replaced by the tentacles when the organism settles down in a permanent environment.

Tenure is a legal term denoting the manner in which the title to real estate is held. It originated during the feudal system of England, and defined the relation which existed between the lord of the manor, and the tenant. The term tenure in its modern signification is extensive, and may import mere possession of real property, or the particular manner by which same may be held.

Tenure of Office is an expression employed in acts relating to public officers, denoting the manner by which such office is held, as well as the duration of its term.

Teocallis, tē-ō-kăl'ĭs, the name given to the ancient temples of Mexico, of which there are extensive remains. They are distinguished by a pyramidal base, square in plan, and rising in stories or terraces, or in an incline of 45°, to an upper platform, on which the temple stands. The most extensive is the pyramid of Cholula, near Mexico, said to have been built before the arrival of the Aztecs. In plan it measures 1,440 feet each way, and has four terraces, reaching a height of 177 feet. Its area is nearly four times that of the great Egyptian pyramid, but in strength of material and skill of workmanship it is vastly inferior, and is now merely a mass of ruins. At Palenque, in Yucatan, is a better-preserved temple. The pyramid rises in an incline, consisting of an unbroken flight of steps, 280 feet square and 60 feet high. The temple is 76 feet wide in front and 26 deep, and is ornamented with bas-reliefs in stucco, and hieroglyphic tablets.

Teosin'te, a fodder-plant. See GRASSES OF THE UNITED STATES.

Tepic, tā-pēk', Mexico, (1) A territory on the Pacific coast between the states of Jalisco and Sinaloa. Area, 11,275 square miles. It is a mountainous country inhabited by tribes of semi-independent Indians. Pop. (1900) 150,002. (2) The capital, Tepic, lies about 20 miles inland from the port of San Blas, with which it is connected by a railroad. It manufactures cotton-cloth and tobacco. Pop. (1900) 15,488.

Teplitz, tĕp'lĭts, or **Töplitz,** tĕp'lĭts, Bohemia, a watering place in a mountain valley, 30 miles southeast of Dresden. Its interesting features are the castle with its beautiful grounds, the town church, bathing establishment, Rathhaus, etc. Its mineral baths are the most celebrated of the country. They consist of 12 hot springs, alkalo-saline, and are of great efficacy in rheumatic affections. Pop. (1900) 24,110.

Teramo, tā'rā-mō, Italy, (1) Capital of the province of its own name, at the confluence of the Tordino and Vezzola, 30 miles northeast of Aquila. It is a bishop's see, and the cathedral dates from the 14th century. Municipal offices and the exchange are the principal buildings. The remnants of Roman baths, theatre, temples, and aqueducts indicate the site of the ancient Interamna. The manufactures include wax, pottery, leather, straw-hats, ornamental furniture, and cream-of-tartar. The ascent of the Gran Sasso is made from this point. In 1460 a fierce battle was fought here between the Milanese allies of the king of Spain and the forces of the Duke of Anjou of France. The ruins of the castle of San Flaviano, in the plains nearby, mark the site of this conflict. Pop

(1901) 24,578. (2) The province lies in southern Italy, and is traversed on the west by the Abruzzi Mountains. Several streams flow through the province to the Adriatic. Wine, grain, oil, and silk are the chief products, and the fisheries are important. The Ancona-Brindisi railway follows the coast, with a branch to Teramo, the capital. Pop. (1901) 307,444.

Ter'aphim, objects similar to the household gods of the Romans, and which are mentioned in several places in the Bible. The reverence paid to them appears to have been very ancient. They were human in form, and from being merely venerated, or used as aids to devotion, might easily become objects of idolatry. The earliest mention of teraphim is in Genesis (ch. xxxi. 19), where Rachel is said to have stolen her father's teraphim, which Laban (ver. 30) calls his gods. In the story of Micah (Judg. xv. 5) the word occurs in our Authorized Version. It was a teraph that Michal, David's wife, put into the bed (1 Sam. xix. 33) to deceive the messengers of Saul. Josiah is represented (2 Ki. xxiii. 24) as putting away the teraphim. In Ezek. xxi. 21 they are represented as used by the king of Babylon for purposes of divination.

Teratol'ogy, that branch of biological and anatomical science which treats of abnormalities or monstrous growths in the structure of plants and animals. While ancient writers dealt with such deviations from normal types of structure, malformations appealed to their imagination as portentous objects of satanic origin, rather than to their deficient scientific sense as subjects of investigation. Early in the 18th century superstition began to give way to physical observation, and the study of character and causation in monstrosities became an important branch of natural history. Defect in the germ is regarded by many embryologists as the original cause of some human anomalies, hereditary persistence of certain deformities in numerous cases resulting. Other malformations are believed to be due to diseased organs, as the brain or the uterus, and to various fœtal disorders. For any extensive information on the curious subject of teratology its literature must be studied. Consult: Moquin Tandon, 'Eléments de teratologie végétale' (1841); Fisher, 'Diploteratology,' in 'Transactions' of the Medical Society of the State of New York, 1865–6–7–8; Masters, 'Vegetable Teratology' (1869); Penzig, 'Pflanzenteratologie' (1890–4), which contains comprehensive literary citations on the subject.

Ter'bium, one of the "rare earth" elements found chiefly in the minerals samarskite and gadolinite. It belongs to the yttrium group and has an atomic weight of 158.8. Its symbol is Tb.

Terborch, tĕr'boorH, Gérard. See TERBURG, GÉRARD.

Terburg, tĕr'boorg, Gerard, Dutch painter: b. Zwoll, near Overyssel, 1608; d. Deventer 1681. His father, a historical painter, who had resided some time at Rome, gave him his first lessons in painting. He continued the study of his art at Haarlem, and afterward visited Germany, Italy, Spain, England, and France, leaving everywhere proofs of his talents as a painter of portraits and of interiors. On the meeting of the European peace congress at Münster he painted in 1648 'The Plenipotentiaries Discussing the Treaty' which contains 69 portraits; it is now in the English National Gallery. The Spanish ambassador at the congress took him to Madrid, where he painted the king and many of the nobles. From Spain he went to London, and afterward to Paris. He then returned to Overyssel, married one of his nieces, and became burgomaster of Deventer. His portraits are remarkable for elegance. He excelled in painting textile fabrics, particularly satin and velvet. His interiors are mostly of the houses of the rich. Few of his pictures are to be found and they are exceedingly costly, his 'Glass of Lemonade,' a small canvas, 25¾ by 20¾, fetching in 1878 the price of $9,720.

Terceira, tĕr-sā'rä, one of the Azores Islands, situated 84 miles northwest of Saint Michaels. Area 163 square miles. It is volcanic and mountainous, with steep cliffs along the shores. The soil is fertile, producing wheat, corn and grapes. The capital is Angra. Pop. (1900) 48,920.

Terebrat'ula, a genus of brachiopods (q.v.). The shell exhibits a punctated structure, due to the presence of numerous minute canals in the shell-structure itself. The ventral valve has a prominent "beak," which is perforated for the stalk. Some species still exist in our seas, although the genus dates back to the Devonian age.

Tere'do, or Ship-worm, a small marine bivalve boring mollusk (*Teredo navalis*), which excavates burrows in wood under (salt) water, attacking the timbers of piers and vessels in immense numbers, and riddling them to such an extent that they are rendered utterly useless, in a surprisingly short time, if left unprotected. It abounds destructively throughout the Mediterranean and Baltic seas, and on both shores of the Atlantic. Its steady burrowings once almost caused the inundation of a large part of Holland. Along the sea-front had been built a system of dikes, made principally of timber. In three years breaks were being patched up, in five whole sections gave way. Only the heroic efforts of the whole seaside population saved the Dutch from one of the worst catastrophes in their history. The timbers were completely honeycombed, so rotten that the wood could be crushed in the hand.

North America suffers as much as Europe from this pest. All down the New England coast piles are attacked and destroyed. In this region two years forms the average life of a piece of submerged timber. Channel buoys are left in the water only six months in the year, then a new set is put in and the old one dried. The zone of the ship-worm's devastation is comparatively large. Wood is attacked between points well above low-water mark and points ten or more feet below it. The hardest oak offers no more difficulty than the softest pine, and the toughest knots are traversed. Teak alone resists the attack.

The agent of this vast amount of damage much resembles a worm, but is a true mollusk. Its long, whitish body, tapering toward the posterior end, is found imbedded in a shell-lined burrow. Individuals of this species sometimes attain the length of ten inches, are one-quarter inch in diameter. Such size, however, is rare, four inches being about the average length.

The "head" end of the animal is covered with

a white bivalve shell. This protects the vital organs of the little creature, and from its anterior opening projects a short "foot" which is probably the instrument by which the burrow is dug and lined with its pearly coating. Two pallets, shaped and fastened to the posterior end of the body, much as leaves are fastened to the stem, close the teredo's hole, and protect from attacks the soft portions of the animal. Between these two plates lie the siphon tubes — used for inhaling and exhaling water. Through the lower of these (bronchial) is drawn the water breathed by the animal, and likewise those minute animalcules which serve it for food. The dorsal tube serves as the organ of excretion. Through it passes a stream of vitiated water carrying along the fæces and the wood excavated. Surrounding both the pallets and the siphon tubes is a much wrinkled muscular band, by which the teredo adheres to its "burrow."

The appearance of the teredo burrow is very peculiar. Outwardly the piece of timber infested shows a number of very small holes. Inwardly it resembles nothing more than a Swiss cheese. The channels run in all directions sometimes so close to each other that the wood separating them is as thin as paper. But between the holes there is always a partition, for the animals never interfere with each other. Their sense of hearing seems to enable them to tell when they are approaching the outside of the wood or are nearing another burrow and they turn aside. The holes are always lined with irregularly laid shell and they generally go with the grain. Like many other mollusca the teredo passes through a long series of complicated metamorphoses before arriving at full maturity. The eggs, from the beginning of the breeding season in May, are confined in the gill cavity. Here they have their first period of growth. From the gill cavity the embryos are discharged in the form of free-swimming animals covered with vibrating cilia or hairs, by which they swim. In this stage they are almost exactly like ciliated infusoria. Next they lose these locomotive filaments and develop a rudimentary bivalve shell. In the third stage their relation to other bivalves is apparent in their resemblance to the common mussel. They have a mantle and shell covering their entire body and another sort of cilia replaces those lost. This bivalve character is further accentuated by the development of a long foot used for creeping and by the appearance of eyes and organs for hearing. These eyes, however, disappear as the animal elongates and the locomotive cilia are lost. In this stage the young teredo, settling on some convenient piece of wood and starting with a hole about the size of a pin-head, begins his burrow, and enlarges it as he goes on, until he has reached his full growth.

The fact that the ship-worm does not use as food the wood it excavates, but simply passes it through its body, has much to do with the failure of many attempts to make wood teredo-proof by poisons. Up to date creosote and dead oils are the remedies which have given the best results. The piece of lumber to be so treated is first steamed. Next the air is exhausted and the poisonous or noxious compound is forced in under a pressure of 400 pounds to the square inch. Usually, however, this system fails of the desired result. At Christiania, timbers poisoned in this manner were found to be, three years later, quite riddled with teredo. In some instances, however, piles so treated have been known to remain free from ship-worms for as many as 15 to 20 years.

Although poisoned timbers are often used for such structures as government docks (which must be as permanent as possible), for ordinary piers and for submerged work, the expense of so treating the wood is generally greater than the cost of periodical renewal. Of course the most thorough defense would be one which prevented the entrance of the young animal. Copper-sheathed vessels are quite free from its attacks, while copper paint, creosote or coal tar frequently applied has the same effect. Piles may be defended by broad-headed nails closely driven, for the ship-worm seems to avoid entering any wood impregnated with iron rust.

A large species of teredo (*T. gigantea*), from Sumatra, has been found to measure from 4 to 6 feet, and to have a diameter of about 3 inches. It bores into the solid mud, and does not appear to destroy timber like its smaller neighbor.

Consult: Cooke, 'Mollusca' (London 1898); Verrill, 'Invertebrates of Vineyard Sound' (Washington 1875).

Terek, tĕ-rĕk', Russia, a river in Circassia, which rises in Mount Kasbek, at the north of the Caucasus, among icy glaciers. It follows a northwesterly course through a narrow valley, then turns east, and after dividing into numerous branches, enters the Caspian Sea. Its entire length is about 300 miles. The main tributaries are the Ardon, Uruch, Malka, and Baskan on the left; the Sunsha, Assa, and Argun, on the right. A series of small fortifications for protection against the mountain tribes are built along the river from Mosdok to the foot of the pass over the Great Caucasus, where the descent is made into Georgia.

Terence, tĕr'ĕns (Publius Terentius Afer), Roman writer of comedies: b. probably Carthage, Africa, 195; d. probably in Greece 159 B.C. While yet a child he was bought by Publius Terentius Lucanus, a Roman senator, who took him to Rome and gave him a good education. His master having emancipated him the young African now assumed the name of his benefactor. Lælius and Scipio Africanus (the destroyer of Carthage and Numantia) admitted him to their intimacy; and as some aver, assisted him in the composition of his plays. About the year 161 he went to Greece, where he is said to have translated 108 of Menander's (q.v.) comedies. Six comedies of Terence's alone are extant — the 'Andria,' the 'Eunuchus,' 'Heautontimorumenos,' 'Phormio,' 'Hecyra,' and the 'Adelphi,' his last piece, brought out in Rome the year before his death. The comedies of Terence were much admired by the cultivated Romans for their exquisite style, the language of Cicero, Cæsar, and the orators, and were likewise esteemed for their maxims and moral sentences. If we compare him with Plautus, his only important predecessor, we miss what Cæsar styled the "vis comica," that sparkling wit and humor which made Plautus the model of Molière. On the other hand Terence has the finer vein of sentiment, the more subtle power of characterization and the purer latinity. He was indeed the founder of polite comedy, the comedy of society in Europe, and his influence has been felt throughout the whole

history of literature. Most of his plays follow closely the originals of Menander, but from the fragments of Menander which remain they do not appear to be mere translations. The comedies of Terence have been translated into English by the elder Coleman and several others. Consult: The edition of Bentley (1726); Vollbehr (1846); Dziatzko (1884); and Conradt, 'Die metrische Composition der Comödien des Terentius' (1876).

Teresa, tĕ-rē'sa (Sp. tā-rā'sä) **Saint**, Spanish conventual reformer: b. Avila, Old Castile, 28 March 1515; d. Alba 4 Oct. 1582. Her attention was drawn in childhood to lives of saints and martyrs, and when she and her brother were children under 10 they set off into the country of the Moors in hopes that some infidel would seize and kill them on account of their faith and that they would thus obtain the crown of martyrdom. Defeated in their object they attempted to become hermits. Her father, a nobleman, Don de Cepeda, placed her, after the death of her devout mother, in a monastery of the Carmelites at Avila when she was 16, and though she lived for some years there without any of her early religious enthusiasm, a change came over her at 20 and she took the veil. Her new spirit of devotion was deepened by reading the 'Confessions of Saint Augustine' and being much distressed by the apparent decay of discipline which she saw around her, she founded in 1562 another convent at Avila, dedicating it to Saint Joseph, and introducing a new order, the Discalced or Barefooted Carmelites, also called Teresians. She began by making this a genuinely mendicant order, but modified this detail of the rule in obedience to her superiors. From this mother house there sprang 16 other institutions of the same order. She spent the later part of her life in traveling from one to another of these branch houses, and the staff, cross, and rosary she wore on these pilgrimages are still preserved at Avila. She was seized with her last illness in the palace of the Duchess of Alva, but at her own request was carried to her convent of San José, where she expired surrounded by her followers. Gregory XV. canonized her (1622) and appointed 15 October as her festival, and Philip III. declared her the second patron saint of the monarchy, Saint James (Santiago) being the first. This decree was confirmed by the Cortes in 1812. She also has a worldwide reputation as a mystic; and among the most famous books of devotion which the Roman Catholic Church can boast are her five works: 'Discurso o Relacion de Su Vida' (1562); 'El Camino de la Perfeccion' (1563); 'El Libro de las Fundaciones'; 'El Castillo Interior' (1577); and 'Santos Conceptos del Amor de Dios.' These have been translated into most of the languages of Europe. Consult: 'Saint Theresa' (edited by Cardinal Manning 1865); Graham, 'Santa Teresa' (1894); Jameson, 'Legends of the Monastic Orders'; Senonville, 'Sainte Thérèse et son Mysticisme' (1893); Joly, 'Saint Teresa' (1903); 'Vie de Sainte Thérèse, Ecrete par Elle-Même' (15th edition, edited by Jules Peyré 1904).

Tere'sians. See ORDERS, RELIGIOUS.

Terhune, tẽr-hūn', **Albert Payson**, American journalist: b. Newark, N. J., 21 Dec. 1872. He was graduated from Columbia in 1893, and in 1894 traveled on horseback through Syria, investigating leper settlements, living among the Bedouins, etc. He has been connected with the New York *Evening World* since 1895, and is an expert writer on physical culture topics. His publications include 'Syria from the Saddle' (1896); 'Dr. Dale: a Story Without a Moral' (with his mother, "Marion Harland," 1900); etc.

Terhune, Mary Virginia Hawes ("MARION HARLAND"), American novelist and writer on domestic science: b. Amelia County, Va., 31 Dec. 1831. She began to write for the press when 14 and in 1856 was married to Edward Payson Terhune. She conducted 'Babyhood' for two years, established the 'Home-Maker' in 1888, was a department editor on the staff of 'Saint Nicholas' and 'Wide-Awake' and is at present on the staff of the Philadelphia 'North American.' Her novels have enjoyed a wide popularity and her cook-books and articles on household management are of practical value, and extensively circulated. The latter include: 'Common Sense in the Household' (1872); 'The Dinner Year-Book' (1877); 'Marion Harland's Model Housewife'; etc. She was the originator of the movement to finish the monument over Mary Washington's grave, and wrote in furtherance of her purpose 'The Story of Mary Washington' (1892). Her other works include: 'Alone' (1854); 'The Hidden Path' (1855); 'Nemesis' (1860); 'Husbands and Homes' (1868); 'Loiterings in Pleasant Paths' (1880); 'His Great Self' (1892); 'More Colonial Homesteads' (1899); 'Dr. Dale,' with her son, A. P. Terhune (1900); etc.

Terlin'guaite, a native oxychloride of mercury, occurring in minute monoclinic crystals in the recently discovered mercury deposits of Terlingua, Texas. It is transparent, has a sulphur-yellow color, brilliant adamantine lustre, hardness between 2 and 3, specific gravity 8.725. It is intimately associated with the other new mercury minerals, eglestonite and montroydite. See Amer. Jour. Science IV., Vol. XVI., Sept. 1903.

Termini, tär'mē-nē, Sicily, in the province of Palermo, 23 miles southeast of the city of Palermo, a seaport, on the northern coast, on a high and fertile point, near the San Leonardo River. It contains a museum, where are preserved antiquities of the ancient *Thermæ Himerensis*, founded 408 B.C., by the Carthaginians. Some ruins of the once famous baths, as well as fragments of a theatre and an aqueduct, still exist. The chief products and exports include macaroni, corn, oil, olives, etc. There are important fisheries, and good thermal saline baths. There is a school of navigation and a technical school, also a picture gallery. Pop. (1899) 32,000.

Ter'minus, a boundary stone or landmark, personified as the god who guards boundary lines and landed property. Jupiter was worshipped in Italy as Jupiter Terminus. The origin of this worship was attributed to Numa, who ordered that every one should mark the boundaries of his land by stones consecrated to Jupiter Terminus, and should offer upon them every year at the festival of the Terminalia sacrifices of cakes, meal, and fruit. This law also applied to the state; but the public termini were neglected in the later period of Roman history, while the termini of private property long retained their sacred character. A ter-

minus stood in the temple of Jupiter in the Capitol. On Roman coins a Terminus is represented like the Greek Hermæ, a square column surmounted by a head.

Ter'mites, White Ants, or Duck-ants, a family of insects composing the order *Isoptera,* which have a superficial resemblance to ants, though far removed from them in structure, being allied to the Mayflies. They also resemble ants in being social insects, living in colonies and building "nests" or "hills." They are widely distributed in tropical countries, but also occur in the temperate parts of North and South America, and a few have established themselves in Europe. Their food consists for the most part of wood, especially in a state of incipient decay, but they also eat a great variety of substances, including dead comrades and excrement. The termite society consists for the most part of wingless, sexually immature individuals, children, potentially of both sexes, which do not grow up. Besides these workers there is a less numerous caste of large-headed, blind, strong-jawed soldiers, but these are not so well differentiated as among the true ants. The workers collect food, form burrows and tunnels, build "hills," and care for the males, females, eggs, and larvæ. The males and females have wings, which the latter lose after impregnation. Then, indeed, the female or queen undergoes a remarkable change, becoming enormously distended with eggs and sometimes attaining a length of 2 to 5 inches or more — "a large cylindrical package, in shape like a sausage, and as white as a bolster." As only the abdomen swells, the resulting disproportion between anterior and posterior parts is very striking. The queen is extremely prolific, having been known to lay 60 eggs in a minute, or about 80,000 eggs in a day. In the royal chamber a male is also kept. It is hardly necessary to say that the queen could not leave if she would. But to understand this imprisonment we must notice that in spring the young winged males and females leave the nest in a swarm, after which pairing takes place; the survivors becoming the imprisoned "rulers" and parents of new colonies.

But Fritz Müller has shown that besides the winged males and females there are (in at least many cases) wingless males and females which never leave the termitary in which they are born, being kept as complementary or reserve reproductive members, useful should not a winged royal pair be forthcoming. Sometimes this casualty occurs, and then the wingless pairs become parents. The complementary kings die before winter; their mates live on, widowed, but still maternal, till at least another summer. Müller points out that, though the production and parentage of wingless males and females involves less mortality, the winged males and females probably cross with those from other nests, thus securing the advantages of cross-fertilization. The workers are diligent in tending the king and queen, in removing the laid eggs, and in feeding the larvæ.

In general appearance and size a wingless termite is ant-like, but the winged forms are much larger and flatter, and their wings are quite different. The workers have large broad heads and strong jaws adapted for gnawing; the soldiers have still larger heads and longer jaws. Besides the jaws and the two pairs of maxillæ the head bears a pair of beaded antennæ, two eyes, and two ocelli, but the workers and soldiers are blind. The thorax has the usual three segments, and bears simple legs; the abdomen consists of nine segments.

The most remarkable termitaries are those of *Termes bellicosus,* abundant on the west coast of Africa and called "ant hills." They are sugar-loaf-like in shape, 10 to 20 feet in height, and, though built of cemented particles of earth, are strong enough to bear a man's weight. Internally there are several stories and many chambers, some for the workers, one for the king and queen, others for the eggs and young, others for storing supplies of compacted minced wood. But the termites do not all build such gigantic nests; although some build homes on the branches of trees, out of masticated woody material, which are larger than barrels.

In Africa *Termes bellicosus* and *T. arborum* are common species. A few species, all probably introduced, occur in Europe. In America only one species is known in the eastern United States, the almost ubiquitous *T. flavipes,* which does an enormous amount of damage by eating out the interior of beams and floors, in old houses; destroying furniture, boring galleries through and through stored books and papers, and ruining many other articles in which their presence is not suspected until no more than a shell remains.

Consult: Hagen, 'Monographie der Termitiden' in 'Linnæa Entomologica' (Vols. X.–XIV., 1855–59); Fr. Müller, 'Beiträge zur Kenntniss der Termiten' in 'Jenaische Zeitschr. f. Naturwiss' (Vols. VII.–IX. 1873–5); Grassi, 'Memoria sulla Società dei Termiti' (Accad. Lincei, Roma, 1892); Sharp, 'Cambridge Natural History' (N. Y. 1895); Howard, 'Insect Book' (New York 1902).

Tern, or Sea-swallow, any of many small gulls (q.v.; also *Laridæ*) distinguished by the long, slender, and straight bill, and by the narrow nostrils, which exist at its base. The wings are long and pointed, and the tail is forked. The common tern (*Sterna hirundo*) is a familiar visitant to North Atlantic coasts. It is a very active bird, seeming to have a ceaseless flight, and feeding upon small fishes. Its average length is 15 inches, the long forked tail constituting a considerable element in this measurement. The color is black on the head and neck, and ashy gray on the upper parts generally. The under parts are white, the legs, feet, and bill being red. These birds have, however, nearly disappeared from the eastern shores of the United States, owing to their ceaseless persecution in their breeding places by egg-hunters and plume-hunters. A large number of species of terns exist in various parts of the world.

Ternate (tĕr-nā'tē) **Islands.** See Moluccas, or Spice Islands.

Terni, tĕr'nē, Italy, in the province of Perugia, on an island, 49 miles northeast of Rome, in the midst of the Apennines. It is surrounded by the Nar River. The main buildings are the cathedral and other churches, convents, and some Roman antiquities, chief of which is an amphitheatre. The celebrated falls or cascades of Velino or Terni near the city, 800 feet high, constitute the main attraction for visitors. They were constructed by the Romans to prevent inundations of the Velino River, by form-

ing an outlet for the surplus water. Terni is a prosperous manufacturing town, and it has important iron and steel works. The chief products of its works are silk and woolen goods, armor-plate, projectiles, steel-castings, rails, guns, etc. This is the birth-place of Tacitus, the historian, and of the emperors Tacitus and Florian. Pop. (1900) 11,000.

Terpenes, tĕr'pēns, a member of a class of hydrocarbons having the common formula $C_{10}H_{16}$, and found in the natural essential or ethereal oils obtained from a great variety of plants. They are usually liquids boiling between 340° and 375° F., of an aromatic odor and but slightly soluble in water. Two of the most important are pinene, the chief constituent of oil of turpentine, and limonene, which is found largely in the oils of orange, lemon, citron, bergamot etc. Camphene is a solid terpene obtained by abstracting the elements of water from camphor. The camphors, two important examples of which are ordinary camphor and menthol, are oxygen derivatives of certain terpenes.

Terpsichore, tĕrp-sĭk'ō-rē ("delighting in the dance"), one of the Muses, the inventress and patroness of the art of dancing as accessory to the singing or recitation of lyrical poetry. She is generally represented with the lyre and plectrum, crowned with flowers and in a mirthful attitude.

Terra Cotta, hard baked clay or earthenware of exceptionally good quality, of uniform texture, hard and durable. The 'English Dictionary of Architecture,' completed before there was much use in England of materials made with cement, speaks of it as artificial stone; but the term has also been used largely for that ancient earthenware of which are made the painted Greek vases which are so important in the history of art, and the inferior but still interesting pieces of Etruria. In common usage, however, the term is employed for such baked clay as is used in connection with architecture, whether in actual building, as where a hollow mass of the baked clay takes the place of a stone, or where a solid casting in the same material is used for molded string-courses and the like, in this way replacing bricks. Bricks indeed, when made of choice material exposed to a great heat, are in all practical respects the same as terra cotta.

In the senses named above the ware is exposed to the weather without a coating of glaze or enamel, and its brown color, darker or lighter, is assumed as a necessary part of its use. It is in this way, too, that are made those interesting Japanese figures — groups, vases, and the like — which were called "imitation bronze" when they were first brought to western countries. These are mostly of the province of Bizen. They are often very beautiful in design, having the same vigor of modeling and perfect finish of all their parts which is found in the Japanese bronzes. The raku-yaki, that interesting brown ware which is used for tea-jars and tea-bowls and is the joy of the collector, is also a variety of terra cotta.

In the European Middle Ages terra cotta, unglazed, and also covered by a colored enamel, was used for roof tiles, and also for the much more elaborate pieces employed for crestings, and especially for those finials (in French *épis*) which are used where the hips of the roof meet the ridge, and where in this way a salient point is produced. These finials often include the wind-vane, which, however, would be commonly of wrought iron. The custom of using terra cotta in these ways lasted into the time of the revival of classic architecture, and some of the most interesting pieces are French of the 16th century; the custom not disappearing until the complete establishment of pseudo-classic uniformity of design throughout Europe. Chimney tops pierced with decorative openings through which the smoke might issue were also made of terra cotta, and the custom still lingers in those simply built houses of Italy, Greece, and Switzerland, where chimneys are built of hard baked earthenware tiles set in strong cement mortar, and in this way made very light and thin.

Purely decorative pieces were also made of this material; but in the way of architectural adornment the most important development was in that Della Robbia ware (q.v.) which, however, is not often spoken of as terra cotta because it is covered completely by an opaque enamel which receives a most brilliant and effective polychromy, adding in this way color to sculpture in the most emphatic and interesting way known since antiquity. Still such pieces as the door-heads of many churches in Florence and elsewhere, and the magnificent altar-backs; the lavabos or washing-fountains, and the like throughout central Italy, are among the most effective pieces to be found in that region. The most extensive and splendid work in Della Robbia ware is the broad frieze of the Hospital at Pistoja.

In the 18th century, terra cotta, which had always been used by the French sculptors for the permanent form of many works of art, received a fresh impulse from the practice of Jean Antoine Houdon (q.v., see also UNITED STATES, SCULPTORS OF), Claude Michel (q.v.) (called Clodion), and others, among whom should be named certain makers of medallions as well worthy of study as the bronze medallions of the Italian Renaissance. In modern French practice portrait busts are very frequently made in baked clay, the same artistic quality being given them as to works in bronze or marble. The difficulty caused by the shrinking of the piece in the drying and subsequent baking is only to be met by extreme care in the selection and preparation of the material. The piece shrinks, but it may be made to shrink uniformly and without disturbing the symmetry.

Modern architectural terra cotta continually comes to the front as a material allowing of much richer treatment at a reasonable price than carved stone; but for some reason it never becomes very general in its application. A large business building in New York had its roof brackets or consols made of this material before 1855. The Boston Museum of Fine Arts contains much decorative terra cotta brought from England, and this front was completed about 1865. The constant demand for fire-proof materials by means of which the exterior of a large building might remain without serious damage in spite of a hot fire across the street, would seem to make brick and terra cotta the obvious material for the facing; but stone, marble and granite still retain their places as the only ma-

terials in favor. One minor reason for this may be in the necessity of filling the hollow block of terra cotta with cement in order that it may be a mass solid enough to take the super-incumbent weight. The general tendency of the time toward the evidence of great cost and the supposed inferiority in dignity of materials of baked clay, are probably the decisive reasons for this neglect. RUSSELL STURGIS.

Terra di Lavoro, tĕr-rä dē lä-vō'rō. See CASERTA.

Terra Verde, or Verte (Italian, "green earth"), a green mineral pigment used by painters in oil. A deposit of this earth is found in the neighborhood of Verona, Italy. There is a similar deposit in the island of Cyprus. The native green found in Italy is a silicious earth colored by protoxid of iron of which it contains about 20 per cent, and it is of extreme value as a permanent and brilliant tint in landscape painting.

Terrace, more or less continuous level-topped ridges marking the sides of river valleys often in several tiers, and of corresponding elevation on opposite sides. They mark former levels of the river, being in fact remnants of ancient flood-plains which have been preserved. Sometimes they may represent ancient water levels as the famous Parallel Roads of Glen Roy in Scotland, and the terraces or elevated beaches surrounding some of the lakes in the Great Basin of western America.

Terracina, tĕr-rä-chē'nē, Italy, in the province of Rome, on a gulf of the same name, near the Pontine marshes, about 18 miles northwest of Gaeta. It is the see of a bishop and has a cathedral and handsome episcopal palace. The cathedral is built in the Italo-Byzantine style and incorporates the pillars of an ancient temple. Excavations have revealed the remains of a splendid temple of Venus. The main occupation consists in the fisheries. Pop. (1900) 11,000.

Ter'rapin. See DIAMOND-BACK; TURTLES.

Terre Haute, tĕr'ē hōt (French, meaning "high land"), Ind., city, county-seat of Vigo County; on the Wabash River, and on the Chicago & Eastern Illinois, two branches of the Evansville & Terre Haute, the Pittsburg, Cincinnati, Chicago & Saint Louis (Penna.), and the Cleveland, Cincinnati, Chicago & Saint Louis R.R.'s. It is 178 miles south of Chicago, 163 miles northeast of Saint Louis, 182 miles northwest of Cincinnati, and 72 miles west of Indianapolis. There are (1904) 11 lines of railroads entering the city and two more in process of construction. It is one of the most prominent railroad and manufacturing cities of the Middle West. Terre Haute is one of the oldest settlements in the State; in 1816 it was laid out as a city, and in 1833 was chartered.

Topography.— The city is beautifully laid out on an elevated plateau, amid picturesque surroundings. It is connected with the west side of the river by several handsome railroad bridges; and for the use of the general public there is now being constructed a fine bridge (contract price, $270,000). There are several parks, the broad streets in summer time present a forest appearance. The residential part has many fine edifices in most beautiful surroundings.

Industries.— The city is in a rich agricultural region and in the centre of coal fields comprising over 2,000 square miles, containing a fuel supply which, at the present rate of consumption, will not be exhausted for 200 years. Coal is shipped from here to points within a radius of 200 miles, and it is a distributing point for about 1,500 car loads per day. The city is the industrial and commercial centre for a large portion of the western part of Indiana and the eastern part of Illinois. The manufacturing industries embrace rolling mills, foundries, distilleries, breweries, flour mills, hominy mills, car works, railroad shops, glass factories, stamping works, feed mills, tool works, fencing works and carriage factory. In the vicinity are large deposits of shale and clay and a number of clay plants are in operation nearby. In 1900 (government census) the total number of manufacturing establishments was 429; total capital invested in plants, $8,938,107; average employees yearly, 5,427; annual wages paid to employees, $2,298,585; cost of material used during year, $8,029,285; total annual value of products, $27,784,619. Owing to the failure of the natural gas supply in many places, there has been since 1900 an influx of manufacturing industries to take advantage of the cheap fuel and the railroad facilities. This accounts for the large increase in population.

Public Buildings.— The prominent public buildings are the government building, the county court-house, city hall, opera house, the Union Station, the schools, churches, charitable institutions, hotels, and several business houses.

Charitable Institutions and Organizations.— The Rose Ladies' Aid Society cares for a large number of the poor, and has charge of the Home for Old Ladies. This Home has an endowment of $100,000. The other institutions and organizations for the relief of the needy are Saint Anthony's Hospital (building cost $160,000), in charge of the Sisters of Saint Francis; Saint Ann's Orphan Asylum, in charge of Sisters of Providence; Rose Orphan Home, endowment, $200,000, building, $130,000; Union Hospital (Protestant), endowment, $25,000; Rose Dispensary, endowment, $200,000; and a number of church aid societies.

Education.— The educational institutions are the Indiana State Normal School, which in 1903 had enrolled 1,036 pupils; the Rose Polytechnic Institute, founded by Chauncey Rose and opened in 1883; a high school, public elementary schools, Roman Catholic and Lutheran parish schools; Saint Joseph's Academy (R.C.); a public library and libraries connected with the Normal School, the Polytechnic Institute, and the high school.

Banks and Finances.— The three national banks have a combined capital and surplus of about $1,100,000; one savings bank has deposits amounting to $1,000,000; and a loan and trust company has a capital and surplus of $300,000. There is one private bank. The average annual cost for municipal maintenance and operation is $400,000. The public schools cost annually about $140,000; the police department $29,000; the fire department $40,500; for municipal lighting and streets $50,000.

Government.— The city is governed by a special charter granted by the legislature. The mayor and common council appoint or elect the

1. Cornice and honeysuckle moulding in the treasury at Olympia. 2. Water-spout from Pompeii. 3. Cornice from a temple at Selinus. 4. Vase decorated in relief from Campania. 5 Vase from Southern Italy. 6 Roman stamped terracotta (Head of Hermes). 7. Greek figure in clay from the Pourtlès collection. 8. Wine-pitcher from Athens (Winged Dionysian Eros). 9. Athena enthroned (archaic). 10. Juno Caprotina (Etruscan tile). 11. A dancing-girl with castanets.

administrative officials. The mayor appoints the boards of public works and public safety; the school board is elected by the council. The chief departments are fire, police, waterworks, and municipal lighting.

Pop. (1860) 8,594; (1870) 16,103; (1880) 26,042; (1890) 30,217; (1900) 36,673; (1904) est. 60,000. WILLIAM W. PARSONS,
President Indiana State Normal School.

Terrell, tĕr'ĕl, **Joseph Meriwether,** American politician: b. Greenville, Ga., 6 June 1861. He was admitted to the bar in February 1882, and in 1884 and 1886 was elected to the Georgia House of Representatives. He was chosen United States senator from Georgia in 1890 and was attorney-general for that State 1892–1900. He resigned in 1902 to accept the nomination for governor of Georgia to which office he was elected in October of that year.

Terrell, Texas, city in Kaufman County; on the Texas Midland and the Texas & Pacific R.R.'s; about 30 miles east of Dallas. It was settled in 1872 by Robert Terrell. It is in an agricultural and stock-raising region. The chief manufacturing establishments are the Midland railroad shops, cottonseed-oil mills, cotton-compresses, flour mill, creamery, and agricultural implement works. There is a large trade in grain, cotton, vegetables, and live-stock. The principal public buildings are eight churches, the Northern Texas Hospital for Insane, the schools, and the library building. The educational institutions are two high schools, one for white and one for colored pupils, Terrell University, public graded schools, and Carnegie Free Library. The two banks have a combined capital of $250,000. The government is vested in a mayor and a council of six members, two of whom are elected annually. About one tenth of the population are negroes. Pop. (1890) 2,988; (1900) 6,330.
Editor 'Transcript,' Terrell, Texas.

Terrestrial Magnetism. See MAGNETISM.

Terrier, the name of several small breeds of dogs. Terriers were originally used for unearthing the fox and for killing rats and other vermin, and several kinds are still employed in these and similar occupations. Some are good watch-dogs, and others are useful as retrievers. The most popular variety is the fox terrier, which came into fashion about 1863. It is generally white, with a smooth, dense, hard coat; its chest is deep and not broad; neck fairly long; nose black; ears small, V-shaped, pendulous. The maximum weight is about 20 pounds, and the tail is usually docked. There is also a wire-haired variety of the fox terrier. The bull terrier (q.v.) for show purposes all white since 1860, is a larger animal produced by crossing a terrier with a bulldog. It has a long, tapering head, black nose, long and slightly arched neck, wide and deep chest, short, close, stiff, glossy coat, and a comparatively short, tapering tail. The Boston terrier (q.v.) is a new and popular American breed, of great docility, kindness and quality. The Irish terrier, a trifle larger than the fox terrier, is of a reddish-yellow, wheaten, or light-brown color inclining to gray, with a hard, wiry coat free from silkiness. Its chest is deep and not too wide; head long and flat; nose black; ears V-shaped and pendulous; neck long and slightly arched; and its tail docked and carried high. The Scotch terrier, a smaller animal, has a rather short, wiry, very dense coat of various colors, such as steel-gray, brindle or grizzled, black, sandy, and wheaten. It has a tapering muzzle, black nose, small, prick or half-prick, sharp-pointed ears, short, thick neck, broad and deep chest, uncut tail carried high with slight bend. The Skye terrier, the smallest of useful terriers, may be of any color. Its coat is double, the under part consisting of short, close, soft hair, and the outer part of long, hard hairs, free from curl or crisp. It has a long head, black muzzle, prick or pendent ears, deep chest, long and gently crested neck, and short legs, and its tail may be carried either high or low. The Clydesdale or Paisley terrier is a kind of prick-eared, silky-coated Skye terrier. One of the newest varieties is the Welsh terrier, about the size of the fox terrier, with a close, wiry coat of a black-and-tan or black, grizzle, and tan color. There is also an English white terrier, not unlike a small bull terrier. The Dandie Dinmont (q.v.) is a favorite small one, of a pepper or mustard color, with a moderately long coat consisting of hardish and soft hair mixed, but without wiriness. Its large head is covered with soft, silky hair; nose black or dark; ears large and pendulous; tail of moderate length, with a regular upward curve. The Bedlington terrier is a slightly larger form, somewhat similar to the Dandie Dinmont. The black-and-tan or Manchester terrier has the head long, flat, tapering; nose black; ears small, V-shaped, hanging; neck long and tapering; chest narrow and deep; tail of moderate length, tapering; coat close, smooth, short, glossy; color jet-black and mahogany tan in different parts. He was produced by long years of skilful selection by the Manchester mill-hands, of England, and is one of the smartest, pluckiest vermin-killers and most interesting pets on the list. The schipperke resembles it, but is of German origin. One of the largest of the terriers is the Airedale, with pendulous ears, deep chest, high tail, hard and wiry coat, lying straight and close, and of a tan, black, or dark grizzle color. The Yorkshire is the best known of the small toy terriers. Consult Lee's 'Modern Dogs' (1896); Huntington, 'The Show Dog in America' (Providence 1901). See DOGS.

Territorial Courts. See COURT.

Territorial Expansion. See UNITED STATES, TERRITORIAL EXPANSION OF THE.

Territorial Waters. See INTERNATIONAL LAW.

Territories, the term applied in the United States to certain parts of the national domain which have not been formed into States. At present they are the organized territories of Arizona, New Mexico, and Oklahoma; the unorganized territories of Alaska and the Indian district; the insular dependencies of Hawaii, Porto Rico, and the Philippines, including Guam and the Samoan islands; and the Federal District of Columbia. The aggregate area of these territories is nearly 1,000,000 square miles, and the total population about 8,000,000. Their political status is one of dependence upon the government of the United States, although the degree of autonomy which they enjoy varies with the different groups. The first group, embracing Arizona, New Mexico, Oklahoma, and Hawaii, are the most favored in this respect, each

being allowed a popularly elected legislature, a governor who is appointed by the President for a term of four years, and a series of courts, the higher judges of which are also appointed by the President, all paid from the treasury of the United States. The legislatures, however, do not have plenary legislative power, and their acts are always subject to modification or absolute veto by Congress. As was said by the Supreme Court in the case of the National Bank *v.* Yankton, Congress may do for the people of the Territories what the people of a State may do for the State and that it can declare void a valid act passed by the territorial legislature or make a valid act invalid. The power of Congress over the Territories is derived from the constitutional provision which empowers that body to make needful rules and regulations respecting the territory and other property of the United States. This has been interpreted as giving Congress general as opposed to enumerated powers in the Territories, that is, what is not denied is granted. The organic law of the Territory consists of the Federal Constitution and the Act of Congress organizing the Territory, in the framing of which the inhabitants have no part. Furthermore the Territories are not allowed to be fully represented in Congress, but may choose a delegate who is given only the privilege of a seat in the House of Representatives with the right to serve on committees and participate in the debates but not to vote. Even this is not a constitutional right but only a privilege which can be withdrawn by Congress at any time. Likewise the citizens of the Territories do not enjoy the right to participate in the election of President and Vice-President, although they are allowed by both political parties to send delegates to the national conventions for the nomination of presidential candidates.

The civil rights of the inhabitants of the Territories are substantially the same as those of citizens of the United States, the Supreme Court having held in a long line of decisions that the prohibitions upon Congress in behalf of personal liberty apply to all the territory of the United States, whether erected into States or not. Since the acquisition, however, of remote insular lands the Supreme Court has modified to some extent its earlier views and has laid down the doctrine that the Constitution does not apply *ex proprio vigore* to the new Territories thus acquired, but must be "extended" thereto by Act of Congress, and furthermore, that Congress may legislate differently for different parts of the unorganized domain (see the Insular Cases decided in 1901; and the case of Hawaii *v.* Mankichi decided in June 1903). Excepting Hawaii all the insular Territories occupy a status distinctly inferior to that of Arizona, New Mexico, and Oklahoma described above. Of these, Porto Rico is the most favored. It has a governor, judges, and other officers appointed by the President and a bicameral legislature, the lower house of which is popularly elected, the upper house or council being appointed by the President. It is represented at Washington by a "commissioner" who until 1904 was not allowed a seat in the House of Representatives. The inhabitants are not regarded as citizens of the United States, although the Supreme Court in December 1903 went so far as to declare that they were not aliens (Gonzales *v.* Williams). The Philippines are at present governed by a commission of seven members appointed by the President. The commission is vested with the power of legislation and administration subject to the veto power of Congress. As yet no legislature has been established, but the act of Congress passed in June 1902 under which the Philippines are now governed, provides that within two years following the date of the enactment of the said law, if a state of pacification exists in the islands, an election shall be held for members of a legislative assembly, of which the upper house is to consist of the members of the Philippine Commission. As soon as this is done the powers of local legislation now exercised by the Philippine Commission will pass to the legislative assembly. As yet no great degree of local self government is allowed nor are the islands represented at Washington either by a commissioner or delegate. The inhabitants are not citizens of the United States and the determination of their political and civil status is left to Congress. The Samoan Islands and Guam are governed by military and naval governors respectively. Of the unorganized domestic Territories Alaska has a governor, judiciary, and other officers, appointed by the President, but has neither legislature nor delegate in Congress. A measure of local self government has recently been allowed incorporated towns of 300 inhabitants. The Indian Territory has neither governor, legislature, nor delegate in Congress. In 1898 Congress adopted a code of laws for the Territory and provided a system of courts. With the completion of the allotment policy of Congress the usual territorial form of government will probably be established. Finally, the District of Columbia is governed by three commissioners, two of whom are appointed by the President from civil life, and the third is detailed from the engineer corps. They have general charge of the administration of the District, including the appointment of local officers. The law-making body, as in the case of Alaska and the Indian Territory, is Congress, and the District has no delegate in the House of Representatives. One half the expense of governing the District is borne by the United States, the other half by the residents.

At no time since the adoption of the Constitution has the United States been without a Territory. In fact before the Constitution had been framed the United States had acquired by the cession of the States a vast domain in the Northwest which was then practically uninhabited. For the government of this domain Congress passed the celebrated Ordinance of 1787, providing that as the population grew the degree of local autonomy should be increased, and that when the number of inhabitants reached 60,000 the part of the Territory should be admitted to the Union as a State, on an equality with the original States. By other treaties of cession new lands were acquired and held for a time under the dependent status in accordance with the American theory that the inhabitants of new territories are unfitted if not incapable of immediate self government, and should therefore go through a pupillary stage of preparation before admission to all the rights and privileges of the Commonwealth status. But in every treaty of cession except those for the purchase of Alaska, Porto Rico and the Philippines the United States government ob-

ligated itself to incorporate the inhabitants into the American Union as soon as consistent with the principles of the Constitution. All the States thus far formed out of territory acquired from foreign nations except Texas and California have passed through the territorial stage. No general rule exists as to the period of pupillage through which the inchoate State shall be required to pass. In some instances, as in the case of Kansas, it has been as short as four years, while on the other hand Arizona and New Mexico after 54 years of territorial status are still denied admission as States. The nearest approach to a general rule is the requirement that the population of the Territory shall be as great as the ratio of representation in Congress, but this has often been disregarded, usually for political reasons. Thus Nevada was admitted for political purposes when its population scarcely exceeded 20,000, while Utah was refused admission long after its population exceeded the Congressional ratio. For a more detailed discussion of this subject see the articles on each separate Territory. See also the several cases cited and the articles on TERRITORIAL EXPANSION, and UNITED STATES HISTORY.

JAMES WILFORD GARNER,
Professor of Political Science, University of Illinois.

Terror, Mount, Antarctic Regions, a volcanic mountain situated close to Mount Erebus (q.v.) on the coast of Victoria Land, in lat. 77° 30′ S. and lon. 167° E. Its height is 10,883 feet. It was discovered in 1841 by Sir James Ross, and named after one of his ships.

Terror, Reign of, the period of the French Revolution extending from the downfall of the Girondists, June 1793, to that of Robespierre (q.v.), 27 July 1794. For an account of it, see FRANCE, *History*.

Terror, The White, the period of Bourbonist reprisals at the second Restoration. (See LOUIS XVIII.) It was so called from the white flag (*le drapeau blanc*) of the Royalists. An "Edict of Amnesty" was published on 24 July 1815, but 57 were exempted from it — 19 to be tried by courts-martial on capital charges, and 38 to be either exiled or brought to justice, as might be determined. In Southern France there was rioting, assassination, and pillage. This was especially true in Nismes and the surrounding region, where the victims were largely of the Reformed faith. The government was slow to intervene, and the Allies were compelled to take matters into their own hands, a detachment of Austrian troops occupying the department of the Gard. In other districts there were similar outbreaks. Consult: Vaulabelle, 'Histoire des Deux Restaurations' (1844 et seq.); and Daudet (L. M. E.), 'La Terreur Blanche' (1878).

Terry, tĕr'ĭ, **Alfred Howe,** American soldier: b. Hartford, Conn., 10 Nov. 1827; d. New Haven 16 Dec. 1890. He was educated at Yale Law School and began practice in 1849. He had been a member of the state militia prior to the Civil War and at the call for volunteers he with his regiment, the 2d Connecticut, responded and was engaged in the battle of Bull Run. Being made a brigadier-general, he served in 1862–3 in the operations near Charleston. He commanded a corps in the Army of the James, and fought at Chester Station, Drewry's Bluff and the siege of Petersburg, and was entrusted with the military part of the second attempt on Fort Fisher, January 1865, co-operating with the admiral. The successful storming of the fort made him a brigadier-general in the regular army. He captured Wilmington, and was a departmental commander after the war. Gen. Terry became major-general in 1886, and retired in 1888.

Terry, David S., American jurist: b. Todd County, Ky., 1823; d. Lathrop, Cal., 14 Aug. 1889. He served in the Texan war against Mexico under Gen. Sam Houston, and in the war between the United States and Mexico; went to Calaveras County on the discovery of gold in California; and after some experience in mining studied law and began practice in Stockton. Elected an associate-justice of the California State supreme court in 1855, he became chief justice in 1857. He strongly opposed the procedure of the "vigilance committee." In 1859 he killed Senator D. C. Broderick (q.v.) in a duel near San Francisco. Broderick had been an uncompromising opponent of the extension of slavery, particularly in Kansas, had taken active part in the bitter California campaign of 1859, and in one of his speeches made certain strictures resulting in a challenge. After service in the Confederate army during the Civil War, Terry resumed practice in San Francisco.

Terry, Ellen Alice, English actress: b. Coventry, Warwickshire, 27 Feb. 1848. Her parents were both actors and she made her first appearance at the age of 8, under the management of Mrs. Charles Kean at the Princess Theatre, London. A little later she won high praise as the young Prince Arthur in 'King John.' During the periods of 1860–3 and 1867–8 she acted with various stock companies, first appearing with Henry Irving in 1867, as Katherine to his Petruchio in 'The Taming of the Shrew.' She was married early in life to G. F. Watts, the painter, but the union was shortly dissolved, and she was married to E. A. Wardell, an actor, in 1864. She was absent from the stage 1868–74, re-appearing under Charles Reade's management, and in 1875 won her first great success as Portia in a revival of 'The Merchant of Venice' at the old Prince of Wales' Theatre. This she shortly followed with the title role in W. G. Will's play, 'Olivia,' the result being that Henry Irving made her his leading lady, and the long artistic partnership at the Lyceum Theatre was commenced. Some of her impersonations at the Lyceum have been Ophelia, Portia, Desdemona, Juliet, Beatrice, Lady Macbeth, Cordelia, Margaret in Will's 'Faust,' the Queen in Will's 'Charles I.,' Pauline in 'The Lady of Lyons,' etc. In company with Irving she has several times visited the United States and has been invariably successful. While still with Irving she joined Mrs. Kendal and Beerbohm Tree in a revival of 'The Merry Wives of Windsor' at Her Majesty's Theatre in 1902. She has recently re-enacted her old success in Irving's revival of 'The Merchant of Venice.'

Terry, Henry Taylor, American lawyer: b. Hartford, Conn., 19 Sept. 1847. He was graduated from Yale in 1869, and was admitted to the bar in 1872. In 1878 he became professor of law at the Imperial University, Tokyo, Japan, but returned to New York in 1884 and resumed practice the following year. In 1894 he again went

to Japan and took up his former duties as law professor at the university. He has published 'First Principles of Law' (1878); 'Leading Principles of Anglo-American Law' (1884); 'The Common Law' (1891).

Tertiaries, tėr'shĭ-ā-rĭz, a name applied to the members of the Third Order of various religious societies in the Roman Catholic Church. Shortly after the institution of the Franciscan Order by St. Francis of Assisi in the beginning of the 13th century, numbers of lay people were affiliated with the Franciscans under certain rules and restrictions, which bound them more systematically to a life of penance and devotion than ordinary persons living in the world. In the course of time many of these Tertiaries desired to take solemn vows, live in community, and still follow the regulations of the Third Order. In this way rose various Tertiary congregations, which gradually united under the one government. Benedict XIII. in the beginning of the 18th century recognized these Tertiary congregations and the laity affiliated with them as "a true and proper order, uniting in one seculars scattered all over the world and regulars living in community." Leo XIII. recommended the Third Order in an especial manner to the faithful throughout the world, as a means of personal sanctification to be embraced by lay people who desired to lead a more devout life.

The Dominicans also had their Third Order Tertiaries, instituted by St. Dominic himself, though in what year is uncertain. It was known as the Military Order of Christ, originally composed of knights and noblemen, whose duty it was to wage war against heretics. After the death of the founder this became the order of the penitents of St. Dominic, for both sexes, and constituted the third order of Dominicans. These Tertiarians, without making any solemn vows, had the assurance of great spiritual privileges through the observance of a few fasts and prayers; they continued, also, in the enjoyment of their civil and domestic relations. Some few companies of Dominican sisters of the Third Order, particularly in Italy, united in a monastic life, and became regular nuns; the most celebrated of whom is St. Catharine of Sienna. Other religious orders after the example of the Franciscans and Dominicans also established tertiary affiliations; the Augustinian hermits in the beginning of the 15th century, and later on the Minims, the Servites, the Carmelites, and the Trappists. At the present time there are numbers of the laity throughout the world affiliated with the third orders and followed their regulations while still following their secular vocations in the world. See DOMINICANS.

Tertiary, tėr'shĭ-ā-rĭ or tėr'sha-rĭ, the name of the rock formations of the Cenozoic time, given to them because they are posterior in date to the rocks termed "Secondary" (the Mesozoic) of which the chalk constitutes the newest groups. These strata were at first confounded with the superficial alluviums of Europe and it was long before their real characters were realized. They occur most generally in patches, — some of them of marine origin, others of fresh-water or of continental derivation. Rocks of this age were first described by Cuvier and Bronginart in 1810 from the Paris basin, where they are well developed and highly fossiliferous. The shells found in these deposits were recognized as different, though related to those of the modern time, while the bones of quadrupeds were found to be of extinct species. Similar strata from the London and Hampshire basins were shortly after discovered, and rocks of similar age in Italy, the south of France, Austria and other parts of Europe were subsequently found. Those of Italy were found in low hills flanking the Apennines on both sides from the plains of the Po to Calabria and called by Basterot, who studied them, the Subapennines. The fossils of these beds were of a more modern type than those of Paris or London. In the neighborhood of Bordeaux in the south of France, another series of Tertiary strata were discovered and described by M. de Basterot in 1825. The several hundred species of shells described from these beds were found to differ mostly from those of the Paris basin and those of the Subapennines, and to possess an intermediate character between the two. Subsequently it was found that strata contemporaneous with those of Bordeaux overlie the Parisian formation in the valley of the Loire, and underlie the Subapennine beds in Piedmont.

In 1828 and 1829 Lyell conceived the idea that the Tertiary beds might be subdivided according to the percentage of living species in each. For this purpose, he and M. Deshayes, a well known French conchologist, compared some 3,000 Tertiary with about 5,000 living species. The result arrived at was, that in the lower strata, or those of London and Paris, there were about 3½ per cent of recent species, in the middle Tertiary of the Loire, Bordeaux, etc., about 17 per cent of recent species, and in the upper or Subapennine Tertiary from 35 to 50 per cent of living species. These results were published in 1833. In formations still more modern, which Lyell studied in Sicily, where they attain a vast thickness, the percentage of living species was found to be 90 or 95. To these four series Lyell applied the names: Eocene, Miocene, Older Pliocene and Newer Pliocene. A still later formation (Post-Tertiary) was called Pleistocene, in which the shells were all of recent types, but the mammals partly of extinct species. The most important recent modification of this nomenclature, has been the introduction of the term Oligocene by Beyrish to include strata formerly classed partly as Upper Eocene and Lower Miocene. At present much less stress is laid upon the numerical method of subdivision employed by Lyell and Deshayes. As the various deposits of the typical Tertiary beds of Paris, London, the Loire Basin, and the Subapennine series became well known a standard of comparison became established, by which similar deposits of other regions could be determined. This is the method employed to-day in deciding to which division a given deposit should belong.

In the United States, Marine Tertiary beds are found on the Atlantic and Pacific coasts. The most important of these are the strata of the Atlantic coastal plain with its extension in the Gulf of Mexico. On the Atlantic coast the Eocene beds are classed together as the Pamunkey formation from the river of that name in Virginia, where the strata are well exposed. They are mostly clays and greensands which

rest unconformably upon the Cretacic strata and are unconformably overlain by the Miocene beds. These latter, in Maryland, Virginia, and adjoining States are known as the Chesapeake group, from their fine exposure on Chesapeake Bay. In North Carolina somewhat higher beds occur — the Duplin beds named from Duplin County, where are some of the best exposures. All of these beds are highly fossiliferous, shells predominating. In the Miocene is a great bed of diatomaceous earth from 200 to 300 feet thick. In South Carolina, Pliocene beds make their appearance on the Waccamaw and Neuse rivers, resting in some places directly upon the Cretacic, the earlier Tertiary beds having probably been removed by erosion in pre-Pliocene time. No Oligocene strata are known from the Atlantic coast. On the Gulf coast, the Eocene is well represented and rests upon the Cretacic. It consists mainly of marls, greensands, clays, and sands, and is divisible into the following stages: (1) Midwayan, (2) Chickasawan, (3) Claibornian, and (4) Jacksonian. Each of these has its particular fauna. Both Oligocene and Miocene are represented on the Gulf coast. The Oligocene beds comprise the Vicksburg group at the base, followed by the Chattahoochee and Chipola groups. These are characterized by a warm-water or subtropical fauna. The Miocene beds of the Gulf States are comprised in the Alum Bluff beds which are equivalent to the Chesapeake group of the Atlantic coast. They represent the advent of the colder water fauna from the North. Pliocene beds of the age of those formed in South Carolina, are extensively developed in Florida, where some of the best known exposures are on the Caloosahatchee River. From this the name Caloosa marls applied to these beds is derived.

Tertiary deposits are well developed in the interior of the United States, between the Mississippi River and the Rocky Mountains. They consist of non-marine strata, partly lacustrine, partly æolian, and partly made up of wash from the mountain sides in the form of coarse alluvial cones or fans. In these deposits numerous bones of extinct mammalia are found, of which extensive collections have been gathered in the various museums of the country, particularly in the American Museum of Natural History in New York. Most of the deposits are in isolated basins, and can only be correlated by their vertebrate fauna. The following represents the important series:

Pleistocene	
Pliocene	Blanco beds
Transitional	Palo Duro beds
Miocene	Loup Fork beds
Transitional	Deep River beds
Oligocene upper	John Day beds
Oligocene transitional	Protoceras beds
Oligocene lower	White River beds
Eocene upper	Uinta
Eocene middle	Bridger
Eocene lower	Wasatch beds
Transition	Puerco beds
Cretacic	Fort Union beds
Equus beds	Denver-Laramie

Among the Eocene mammals from these beds may be mentioned the prototypic omnivore *Phenacodus* from the Wasatch and the prototypic carnivores of the class of *Creodonts* from the Puerco beds. Another prototypic form from the Wasatch bed is the *Coryphodon*. Primitive tapirs, and primitive horses, with four toes (*Orohippus* and *Eohippus*), also occur here. Among the Oligocene mammals may be mentioned the *Titanotheros*, from the White River beds, and the *Mesohippus*, or horse with only three functional toes. The peculiar *Oreodon* occurs in beds above the *Titanotherium*, and represents a type intermediate between hog and deer in structure. Early camels, the earliest true carnivores, early bats, squirrels and rodents, and marsupials also occur in these beds. *Miohippus*, a still more modified horse, occurs in the John Day and the Deep River beds; in the latter also occurs the oldest mastodon. In the Loup Fork beds occur *Procamelus*, *Mastodon*, and dogs of the genus *Canis*, and the Pliocene Blanco beds have afforded *Megalonyx*, *Mastodon*, and *Equus*, the latter of a species closely related to modern horses.

On the Pacific coast the Eocene is represented by the Tejon group, the Kenai group and the Arago beds; the Oligocene, by the Aturia beds and the Astoria shales, while the Miocene and Pliocene are represented by a large number of formations in various parts of the Pacific Coast States. See CENOZOIC ERA; CHESAPEAKE STAGE; CLAIBORNE STAGE; EOCENE SERIES; MIOCENE PERIOD.

A. W. GRABAU,
Adjunct-Professor Palæontology, Columbia University.

Tertiary Era, the space of time, geologically considered, immediately preceding the present era, and occupying the earlier and larger part of the Cenozoic, or "third" stage in the palæontologic history of the world (see GEOLOGY). The general characteristics of geography, vegetation and animal life were similar to those of the present time, but land areas were of less extent and were more largely occupied by interior fresh-water basins. The climate of the Tertiary was evidently warmer and more moist than that of the period preceding it, types of plants now strictly tropical then covering areas now under arctic latitudes and influences; but steady improvement proceeded toward dryness and coolness. At the close of the Cretaceous period all the flying reptiles and dinosaurs, and most of the marine reptiles, seem to have become extinct; and the Tertiary formations, so far as known, yield only forms of *Vertebrata* essentially similar to those of the present day. "Among fishes," says Woodward, ". . . all the existing suborders, and many of the existing families or even genera seem to occur in the Eocene; and the chief interest of the Tertiary fish-fauna consists in its varying distribution at different times both in the seas and fresh waters. Except the ordinary turtles and a solitary rhyncocephalian (*Champosaurus*) no vertebrates higher than fishes have been found at the base of the Tertiary series. . . . The terrestrial vertebrata are of much more importance; for the *Mammalia* suddenly appear as the dominant type on all the continents and the evolution of many of the minor groups can be traced.

"Among the invertebrates, ammonites, belemnites, *Rudistæ* and most of the crinoids had passed away when the Tertiary era began; and the types of forms came in whose descendants are now familiar to us."

This era is divisible, stratigraphically and palæontologically, into four periods in order from earliest to latest as follows: (1) Eocene, (2)

Oligocene, (3) Miocene, (4) Pliocene. The Eocene appears in extensive formations largely of lake-deposits, forming four successive subperiods, Basal, Lower, Middle and Upper Eocene. The first occurs at Rheims, France, and in the Rio Puerco beds (lacustrine) in New Mexico and Colorado. In this fauna there are still typical, though highly specialized members of the Jurassic group of *Multituberculata,* but the large majority of the genera belong to the *Creodonta* and *Condylarthra,* or ancestors of the *Carnivora, Insectivora* and *Ungulata.* Lower Eocene fossiliferous beds crop out in Great Britain and northwestern France, and in the Rocky Mountain region (Wasatch, etc.). Marsupials (opossums) still exist in both continents, the ancestral types of horses and other perissodactyls appear, and a few early artiodactyls; but the characteristic ungulates of the period are amblypods, prominently *Coryphodon* (q.v.). Lemuroids and rodents first appear, and crustaceans and insects begin to become prominent. The Middle Eocene is best known by the extensive lake-deposits of Wyoming and Colorado, which are rich in vertebrate remains. Here first appear the great titanotheres and *Dinocerata,* and bats are introduced. The Upper Eocene is the period of the Uinta lacustrine beds of Utah and of fresh-water deposits in Europe and northern Africa. The perissodactyls (see HORSE, EVOLUTION OF) develop and artiodactyls become numerous, and foreshadow the swine, ruminants and camels, which seem to have originated in America. Oreodonts, cetaceans and sirenia first appear, while rodents increase and diversify, opossums still persist in Europe, and lemurs disappear from America and Europe.

At this point marine zoologists, having in view the corals, mollusks, crustaceans, etc., which crowded the seas, find it necessary to separate a division called Oligocene; but no such a period seems marked among terrestrial animals.

Lower Miocene time is represented by widely scattered European fresh-water and brackish water deposits in Europe and southern Asia, and in North America by the White River formation, which was deposited in a series of vast shallow lakes covering the present plains from Kansas to Assiniboia. The *Creodonta* come to an end. *Carnivora* become abundant, and among ungulates horses advance, and hornless rhinoceroses appear on both continents, with many other large artiodactyls. The Middle Miocene, to which are referable the John Day beds of Oregon and Montana, and many well-known European deposits, is remarkable in Europe for the sudden appearance of proboscideans (dinotheres and mastodons), apes, deer with antlers, and horned rhinoceroses; none of these are known as yet in America, where the characteristic animal of the period is the sabre-toothed tiger in various species. Our West exhibits, however, a succeeding "horizon" (Loup Fork beds), called Upper Miocene, in which a mastodon, advanced horses, antlered deer, camels and many sorts of lower animals first appear.

The Pliocene and Pleistocene faunas of the Old World are very rich and well known, not only in Europe but in India, China and Malaya. In North America they are as yet very imperfectly known. This was the period of the arrival of the kinds (genera) of animals now familiar to us — single-toed horses, bears, beavers, elephants, true oxen and deer, and mankind; and of the disappearance of the mastodons, the giant beaver (Trogonotherium), and other relics of a previous state of things. Many of these animals, now restricted to the tropics, then flourished in northerly latitudes; and their remains are found in Great Britain, which was at this time a part of the European continent.

"Having thus traced the series of mammalian faunas through the Tertiary formations both of the Old World and of North America," says Woodward, "it is interesting to speculate as to where the various elements arose. At the base of the Eocene it is evident that the faunas of the East and the West were essentially identical. As they are traced upward they gradually diverge. The first noteworthy difference is the great development of the *Condylarthra* in America, and the rise in the Eocene of the large specialized *Amblypoda,* of which only a single genus (*Coryphodon*) has been found in the corresponding fauna of Europe. On the other hand, the still larger ungulates of the sub-order *Proboscidea* seem to have originated in the Old World and did not reach America until the late Pliocene. The *Perissodactyla* — the tapirs, rhinoceroses, and horses — appear to have advanced on a parallel course on the two continents; though in America both the rhinoceroses and horses became extinct at the close of the Pliocene, the former without acquiring the characteristic horn. Among *Artiodactyla,* both the *Cervidæ* and *Suidæ* seem to have been approximately parallel in their development on both continents, only differing in some minor branches which soon became extinct. The *Camelidæ,* however, are clearly American throughout, only wandering into the Old World by Asia in the Pliocene. It is almost equally probable that the *Bovidæ* originated in the Old World. Among *Carnivora,* the *Creodonta* are both American and European; but on the former continent they only pass upward into *Canidæ, Mustelidæ,* and the aberrant cats of the family *Nimravidæ,* while in Europe they are succeeded not merely by these families, but also by the *Viverridæ, Hyænidæ, Felidæ,* and *Ursidæ.* The viverroids and hyenas never reached America, but the true cats and bears arrived in that continent at the close of the Pliocene. Of the *Primates,* the primitive lemuroids appeared in the Eocene similarly on both continents; but in North America they soon became extinct, while in the Old World they were followed by the true apes and still have some specialized survivors."

Consult: Dana 'Manual of Geology' (New York 1895); Zittell, 'Text-book of Paleontology' (New York 1900–4); Cope, 'Vertebrata of the Tertiary Formations of the West' (Washington 1884); Williams, 'Geological Biology' (New York 1895); Woodward, 'Vertebrate Palæontology' (London 1898), which contains an extensive bibliography.

Tertullian, tėr-tŭl'yan, **Quintus Septimius Florens Tertullianus,** Latin Father of the Church: b. Carthage about 160 A.D.; d. about 230. He was the son of a proconsular centurion, became a jurist at Rome, was converted to Christianity, but latterly gave up the orthodox faith and went over to the Montanists, who on most points of doctrine were at one with the orthodox Christians, though they were distinguished by greater austerity in manners and

severity in discipline. (See MONTANUS.) Among moral and disciplinary works probably written while he was a member of the Church are 'De Pœnitentia,' and 'Ad Uxorem,' containing advice to his wife not to marry again after his death, and especially not to marry a heathen. Among doctrinal works written after he became a Montanist are 'Adversus Marcionem,' written against the Gnostics; 'De Anima,' a philosophical treatise of Stoical tendencies; 'De Carne Christi,' asserting against the Gnostics the reality of the incarnation; 'De Resurrectione Carnis,' of the reality of the resurrection of the body; 'Adversus Praxeam,' against the heresy of the incarnation of the Father; 'De Fuga in Persecutione,' against the orthodox opinion that Christians might save themselves from persecution by flight; 'De Jejuniis,' a defense of Montanist austerities; 'De Pudicitia,' against granting absolution to those who had fallen into unchastity after marriage. Works probably, but not certainly, written after he had become a Montanist, are such as 'De Spectaculis,' against Christians attending the public games; 'De Idolatria,' against unlawful compliances with heathen usages — in this work he declares that no true believer can accept any public office or serve as a soldier in the armies of the state. To what period of his life the most celebrated and most elaborate of his works, the 'Apologia,' belongs is not certain. This is a formal defense of Christianity addressed to the Roman magistrates. He repudiates the charges of atheism and immorality brought against the Christians by the vulgar, and retorts upon the heathen. Among other works whose period is not known is 'Adversus Hermogenem,' in which Tertullian held with the Stoics the doctrine of the materiality of the divine nature; but in this treatise he maintains the doctrine of the creation of the world out of nothing as opposed to the eternity of matter *per se* maintained by Hermogenes, a convert from Christianity to Stoicism.

The writings of Tertullian display great learning, impetuous energy, force of imagination, and keenness of wit, along with some of the faults of style bred by the provincial literary taste of Africa. His works are valuable for the light they throw on the doctrine and discipline of the Church in the age in which he lived. Consult: Migne, 'Patrologia Latina'; Farrar, 'Lives of the Fathers'; Hort, 'Ante-Nicene Fathers' (1902); Bindley, 'The Apology of Tertullian' (1902).

Tesla, tĕz'lä, **Nicola:** b. in Smiljan, province of Lika, Austrian Croatia, in 1857; early education in Gospich; graduated from Real Schule, Karlstadt, in 1873; studied at Polytechnic School, Gratz, capital of Croatia, with the intention of becoming a professor of mathematics and physics, but became interested in electricity, and took up and completed an engineering course. He afterward studied philosophy and languages at Prague and Budapest, keeping up meantime his electrical and engineering studies. For some time he was employed in the government telegraph engineering department as an assistant, and while there invented several improvements which attracted notice. Then he became engineer for a large lighting company in Paris, and next turned his attention to the United States as a promising field for electrical talent and experience. Here he formed a connection with the Edison Company at Orange, N. J., but gave up this engagement in order to be entirely free in his electrical work. He has made himself well known by his many practical inventions, and the boldness and brilliancy of his ideas as to the possibilities of electrical science. These ideas, which have aroused widespread interest, have also in some degree diverted attention from the many useful contributions of Tesla to the world's fund of scientific achievement, most of which have been developed in the Tesla laboratory in New York, which he established for the purpose of independent electrical research.

Tesla's researches in electrical oscillation created a new field of electrical investigation, the full possibilities of which have by no means been exhausted. He was the first electrician to conceive an effective method of utilizing the undulating current, converting electrical into mechanical energy more simply, effectively and economically than by the direct current. He invented the modern principle of the rotary magnetic field, embodied in the apparatus used in the transmission of power from Niagara Falls. He has also invented many new forms of dynamos, transformers, induction coils, condensers, arc and incandescent lamps, the oscillator combining steam-engine and dynamo, etc.

Test Acts, in Great Britain, are acts meant to secure that none but rightly affected persons and members of the established religion shall hold office, include all such acts and enforce oaths of abjuration, allegiance, supremacy, or, among the clergy, uniformity; as well as requiring members of corporations to receive the sacrament after the manner of the Church of England. The term is specially used for two English statutes imposing certain oaths on the holders of public offices. The act of 1673 directs that all magistrates shall take the oaths of allegiance and supremacy, and provides that they must receive the communion according to the rites of the Church of England within a year before their election. A Scottish act was passed in 1681. Another act of 1685 imposed the like conditions on the holders of all public offices, civil and military. These acts, which were evaded to a large extent by means of an act of indemnity passed every year, were not finally repealed till 1829. The universities had their own special tests, now abolished save in the case of offices with clerical functions. See OATH.

Test-papers, slips of unsized paper soaked in solutions of vegetable coloring matters, used as indicators of the presence of acids or of alkalies, and, in some instances, of special chemical compounds. The most common test-papers are litmus and turmeric papers; the former papers are colored with an aqueous solution of a blue substance obtained from various species of lichens, the latter with a solution in spirit of a yellow powder obtained by grinding the roots of a species of Curcuma cultivated in India and Java. Blue litmus is reddened by acids, the blue color being again restored by alkalies; turmeric is turned brown by alkalies. There are also phenolphthalein and amido-benzol papers, which cannot be classed as vegetable coloring matters, though organic, while the use of papers soaked in inorganic compounds is not infrequent in analytical laboratories.

Testament. See BIBLE.

Tes'ticle, one of the two genital glands of the male in which the spermatozoa and some other of the constituents of the semen are formed; a testis. The term is also applied to either of the posterior tubercles of the optic lobes or corpora quadrigemina. The testicle proper lies in the scrotum, is of an oval form, and is mostly invested with a pouch or closed sac of serous membrane, the tunica vaginalis, derived from the peritoneum during the descent of the gland in the fœtus from the abdomen into the scrotum. The organ consists of a central portion or body, an upper enlarged extremity, the globus major or head, and a lower extremity, the globus minor or tail. Lying upon the posterior border of the testicle is a long narrow flattened body, the epididymis. To this border is attached the spermatic cord, composed of arteries, veins, lymphatics, and nerves, connected together by areolar tissues and invested with fasciæ. This cord ends in the internal abdominal ring. It is accompanied by the vas deferens, the excretory duct of the testis (a continuation of the epididymis), which passes through the ring into the pelvis to the base of the bladder, where it unites with the duct of the vesicula seminalis to form the ejaculatory duct, which terminates in a slit-like orifice in the prostatic portion of the urethra. Underneath the tunica vaginalis is the tunica albuginea, or fibrous covering of the testicle, and beneath this coat is the tunica vasculosa, or vascular tunic, composed of a plexus of blood vessels held together by delicate areolar tissue. The glandular structure of the testis consists of from 250 to 400 lobules, each composed of from one to three or more minute convoluted tubes, the tubuli seminiferi. These tubules unite into larger tubes, which carry the seminal fluid from the testis to the epididymis.

The testicle is subject to hypertrophy, atrophy, injuries, acute or chronic inflammation, cystic diseases, fibroma, malignant disease, and neuralgia. Inflammation of the testicle (orchitis), as that of the epididymis (epididymitis q.v.), is usually attended with much pain and swelling and a feeling of weight and great discomfort. The use of a properly fitting suspensory bandage affords much relief; but the treatment of diseases or disorders of the testicle should be entrusted to a physician. See also SPERMATOZOA.

Testing, in chemistry. See ANALYSIS.

Testing Machines. Testing machines are employed to determine the physical properties of metals, and other materials such as cement, used for engineering and structural purposes. They are used especially in the testing of steel. The prime requisite of a material to be used in engineering operations, is the property termed "strength," which is its capability to withstand the action of forces that might be applied to it in various ways so as to produce tensile, compressive, bending, shearing, and twisting strains. Very often the force applied is a combination of two or more of these strains or stresses, and the metal is called to withstand also the effects of abrasion or wear. Physical tests are of two general classes — those made to determine the suitability of a grade of material for a particular purpose, and those by which the effects, of differences in chemical composition, and different methods of manufacture, on the properties of the material, are studied scientifically.

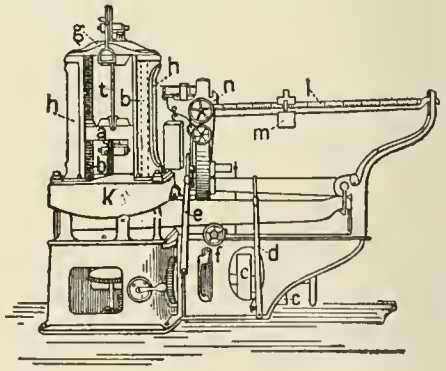
The most satisfactory method that may be employed for this purpose is to actually load a specimen of the material under test and gradually increase that load up to the breaking weight, and observe the effects thus produced. Such a method, however, is too slow and cumbersome, since the loads required for even the simplest commercial tests are very seldom less than 50,000 pounds, and loads ranging from 150,000 to 250,000 pounds are commonly used, and make the direct application of weight impracticable in most cases. Therefore, various machines have been devised by which any load, from the smallest that will perceptibly affect the specimen, up to the breaking load, may be readily applied and its weight accurately determined.

Of these there are two general types — those by which the specimen is loaded by means of a hydraulic press, and those employing a screw generally combined with a train of gearing.

Excepting the Emery machine, which is the most ingenious and accurate that has been invented for the weighing of heavy loads, hydraulic machines are not much used at the present time. Their disadvantages are due to the difficulty of keeping the press filled with a suitable liquid, the difficulty of keeping the packing of the plungers in good order, and the intermittent application of the load by the strokes of the pump.

In both types the load is applied in such a way that it acts through some form of weighing machine which enables the operator to determine instantly the weight of the load or the amount of the force being applied.

The general construction of the screw machine is shown by the accompanying illustration of the Riehlé machine, which may be readily used to subject a suitable specimen to any one of the three classes of strains — direct tension, direct compression, and the transverse or bending, so that the weight of the load can be accurately determined.



Riehlé Testing Machine.

Referring to the illustration, the operation of the machine may be described as follows: The sliding head (a) may be moved up or down by the two screws (bb) which are operated by power derived from any convenient source and transmitted by belts on the pulleys (cc). These pulleys are loose on their shafts, and being provided with a cross belt on one and an open belt on the other, rotate in opposite directions. The

lever (d) actuates friction clutches which connect either of the pulleys with its shaft, so that the motion is communicated to the screws by gearing and thus raises or lowers the sliding head (a). By using the lever (e) and the hand wheel (f), the gears may be so combined as to give various speeds to the sliding head (a) as may be required in different classes of tests. The stationary head (g) is supported by columns (hh) which rest upon the platform (k) of the scale. The weighing beam (i) of the scale carries a movable counterpoise (m) which works on rollers along the beam. A hand wheel (n) operates a screw or chain which lies along the top of the beam and enables the operator to move the poise out along the beam gradually as the load is increased and thus observe constantly the weight of the load being applied. In some cases the poise may be arranged to be moved automatically by means of gearing operated by electrical connections, the circuit being made or broken by the action of the beam as it rises or falls.

In making a tensile test, the specimen is held between two pairs of jaws, one in each of the heads (a) and (g), as shown at (t). The head (a) is then drawn down by the screws, and the pull on the specimen presses the standards of the head (g) down upon the platform of the scales and causes the weighing beam to rise. In a compression test, the specimen is placed upon the platform of the scale and the sliding head is drawn down upon it. In a transverse or bending test, the specimen is placed on two supports carried by a heavy frame which is placed upon the platform of the scale, and the load is applied by means of a projection on the under side of the sliding head which presses upon the centre of the specimen when the head is drawn down.

Another machine of the screw type in extensive use is that built by Tinius Olsen. It is similar in principle to the Riehlé, but it employs four screws to operate the sliding head.

These machines are not only used to test metal specimens, but may also be used to test wood, cement, and other classes of building material. In testing cement, small briquets of the material are made with a predetermined cross sectional area at the centre and are then subjected to the tests as any other specimen.

In the testing of metals, the tensile test gives the simplest and most reliable data for determining the properties of the greatest interest in engineering operations.

W. Morey, Jr., C. E.,
Consulting Engineer.

Testu'do, among the ancient Romans a cover or screen which a body of troops formed with their oblong shields or targets, by holding them over their heads when standing close to each other. This cover somewhat resembled the back of a tortoise, and served to shelter the men from missiles thrown from above. The name was also given to a structure movable on wheels or rollers for protecting sappers.

Tet'anus, a disease characterized by spasm of some or all of the voluntary muscles. The spasms vary in rigidity, and strong exacerbations attend their recurrence. Tetanus is a true toxæmia, and occurs in several varieties, the most familiar of which is lockjaw (trismus), whence it is commonly called by this name. The disease in all its forms (tetanus neonatorum, puerperal tetanus, idiopathic, traumatic, and rheumatic tetanus) is known know to be caused by the tetanus bacillus, which was discovered by Nicolaier in 1884. Kitasato cultivated it in 1889. The bacillus is a slender rod, round-ended, existing in surface soil, dust, manure, etc., and as a rule occurring singly except in cultures. It lodges in some wound, often a slight and unnoticed wound, and the production of the disease is always a proof of its presence. Except in rare instances, the bacillus does not pass beyond the point of infection into the body. The real nature of the tetanus poison has not yet been determined, but its virulence is deadly in the extreme, and it is rapidly absorbed by the body in which it has found lodgment. It is carried through the body in the blood.

In milder cases the spasm of tetanus may be localized in certain muscles. Various theories regarding the action of the poison have been held by pathologists, and the satisfactory explanation is still being sought by specialists in bacteriology and toxicology. Following childbirth, tetanus may infect both mother and child, and the average death rate from this disease, always high, is especially so among children. Surgical operations are sometimes followed by tetanus, but antiseptic surgery has doubtless lessened its frequency, and among diseases it is regarded as rare. Within about ten days after an injury resulting in the disease it sets in, the muscles at the back of the neck and those of mastication being usually first affected. The patient can neither masticate nor freely open his mouth. Often the progress to general rigidity of the muscles is very rapid, and convulsions of extreme violence ensue. Respiration is arrested, and death is often caused by this suspension. In other cases it results from spasms of the glottis, or from exhaustion produced by the violence of spasms.

There is no satisfactory treatment of tetanus, but such as physicians adopt is both local and general. Nothing is more important than careful cleansing of wounds, however slight, for precautionary purposes. Antitoxic disinfectants must be used, capable of destroying the poison produced by the bacilli as well as the bacilli themselves. Iodine solutions should be thoroughly applied to every tetanus wound. Potassium bromide, chloral, calabar bean, morphine, and antimony produce good results, and opium and chloroform are employed for their quieting effects. Amputation is sometimes resorted to. Increase of fluids in the body by drinking or by intravenous injection, and corresponding increase of diuresis aid in eliminating the poison. Antitoxin serum (see Serum Therapy), prepared from the blood of the immunized horse, has proved a true remedy for tetanus, and many cures have been effected by its early administration. Preventive methods, especially those of inoculation, are now receiving the earnest attention of specialists. Consult: Wallace, 'Indian Medical Record' (1891); Roux, 'Annales de l'Institut Pasteur' (1893); Bassano, 'Recherches experimentales sur l'origine microbienne du Tetanos' (1900); Moschcowitz, 'Tetanus' in 'Annals of Surgery' (1900).

Tet'rachord, a term in music meaning a scale-series of four notes. The word in its present use signifies a half of the octave scale.

The fundamental system in ancient music was the tetrachord, or system of four sounds, of which the extremes were at the interval of a fourth.

Tetrad'ymite, a native bismuth telluride, often containing some sulphur and a trace of selenium. It occurs in pale steel-gray, metallic, foliated masses, in scales, or more rarely in small rhombohedral crystals. It is soft enough to mark paper, its hardness being 1.5 to 2; while its specific gravity is high, 7.2 to 7.6. It occurs in Austria, Sweden, and various localities in Virginia, North and South Carolina, Georgia, Arizona, and Montana. It is also called telluric bismuth.

Tetragram'maton, a Greek term meaning "the word of four letters," and applied to the sacred Hebrew name of the Deity from the fact that in the Rabbinical writings it is distinguished by various euphemistic expressions, as "the name," "the name of four letters," etc. Hence applied to other words of four letters expressive of a Godhead.

Tetrahe'drite, or **Gray Copper,** a rather common and valuable ore of copper and silver. It is essentially a copper sulphantimonite, differing from tennantite into which it passes by insensible gradations only in the preponderance of antimony instead of the arsenic which distinguishes the latter. Its color and streak are usually steel gray; it often has a brilliant metallic lustre; its hardness varies widely from 3 to 4.5; its specific gravity is also quite variable, being from 4.6 to 5.1 in ordinary tetrahedrite, 4.5 to 5 in the argentiferous varieties (freibergite), 4.7 to 5.03 in the mercurial varieties (schwatzite). It crystallizes in the isometric system and owes its name to the fact that its crystals are invariably of tetrahedral habit. It occurs in fine specimens at many localities in Austria, Germany, England, and Colorado, and is very widely distributed in massive form in copper and silver mines all over the world.

Tetrarch, tĕt'rärk or tē'trärk (Greek, *tetrarches*), a term which meant the ruler of one fourth of a country, but which was applied by the Romans to subordinate princes with small territories, especially in Palestine and other parts of Syria in the early years of Christianity. The two sons of Herod the Great, Philip and Herod Antipas, who received the lesser shares of his realm, were called tetrarchs, while Archelaus, who received the principal portion, had the title of ethnarch.

Tetuan, tĕt-oo-än', Morocco, a town on the northern coast of Africa, 33 miles southeast of Tangiers. It is defended by a castle. It is the only open port of the country on the Mediterranean, and lies a short distance south of Gibraltar. It is well built, and many of the handsome private residences are the homes of Moorish exiles from Spain. The town is surrounded by fine vineyards, groves and orchards. The Hebrew merchants carry on a lively trade in fruit, wool, silk, girdles, leather, and cotton. Provisions are exported to Ceuta. Pop. 25,000.

Tetzel, tĕt'sĕl, or **Tezel, Johann,** agent for papal indulgences (q.v.): b. Leipsic about 1455; d. there August 1519. He entered in 1489 the order of the Dominicans, and was ordained priest toward the end of the century. He soon began to appear in public as a preacher, and gained a great reputation for his oratorical gifts. When in 1514 Leo X. issued a Bull granting an indulgence to all who would contribute to the building of Saint Peter's Church at Rome, Tetzel was selected to preach it in those provinces subject to the jurisdiction of the archbishop of Mainz. Luther came out in 1517 with his theses against this practice. These were answered by Tetzel, and the students of Wittenberg burned the answers in the market place. Tetzel himself received a severe reprimand from the papal chamberlain, who was sent to settle the dispute, but was vindicated at Rome from the charges that had been brought against him. He died of the plague in the Dominican convent at Leipsic. His life has been the occasion of much controversy owing to the part he took at the outbreak of the Reformation, but recent historical investigation has done much to rehabilitate his character. His life has been written by Hoffmann (1840); by Körner (1880), and on the Roman Catholic side by Gröne (1860) and Hermann (1883).

Teuffel, toĭf'fĕl, **Blanche Willis Howard,** Baroness von, American novelist: b. Bangor, Maine, 21 July 1847; d. Munich, Germany, 7 Oct. 1898. She was educated in New York, but in 1878 she removed to Stuttgart, Germany, where she engaged in teaching and also edited for several years a magazine printed in English. She was married to Baron von Teuffel in 1890. Her publications include a book of travel, 'One Year Abroad' (1877), and among her novels are: 'One Summer' (1875); 'Aunt Serena' (1886); 'No Heroes,' a story for boys (1893); 'Seven on the Highway,' short stories (1897); etc.; and her works published posthumously are 'Dionysius the Weaver's Heart's Dearest' (1899), and 'Garden of Eden' (1900).

Teutoburger Wald, toit'ō-boorg-ĕr vält, Germany, in Westphalia, a series of wooded hills, which begin on the left bank of the Diemel, near Warburg, and passes northward in the direction of Driburg, then northwest toward Örlinghausen, Bielefeld and Halle, finally Lengerich and Tecklenburg, and disappear in broken hills near Bevergern. Under the name of Egge (q.v.) they are steep and high and appear like a long wall; the highest point is Völmerstod (1,400 feet). There are, however, two lower parallel ranges. The second part is the Lippische Wald (q.v.), also called Osning, believed by some authorities to be the real Teutobürger Wald. The third section includes the Ravensberg, Osnabrücken and Tecklenburg Mountains. The name is taken from Tacitus' annals, where an account is given of the defeat of the Roman general Quinctilius Varus by Arminius in the 1st century A.D. The Hermann monument on the Grotenburg commemorates this victory.

Teutones, tū'tō-nēz. See Germany.

Teutonic Knights, one of the three great military and religious orders which originated at the time of the Crusades. Its name was derived from a German hospital founded at Jerusalem in 1128. The Teutonic order adopted the Augustine rule of life, and, in addition to the ordinary monastic vows, the members took upon themselves special obligations to fight against enemies of the Christian faith, and to attend sick and wounded pilgrims.

The order received charters from the pope and the emperor entitling it to the same privileges as the Templars and Knights of St. John. The distinguishing garb of the order was a white mantle with a black cross. The members were required to be Germans of honorable birth. Its first seat was at Acre, but it soon acquired, by gift and conquests, considerable territories in Germany, including a large part of what is now the kingdom of Prussia. When Prussia became a secular duchy the order continued to exist as an ecclesiastical body, possessing 11 bailiwicks in different parts of Europe, with a total area of 850 square miles, and 88,000 population. France seized the territories of the order, west of the Rhine, in 1801, and Napoleon suppressed the order in 1809, its lands being annexed to the states within which they were situated. In 1840 the order was revived in Austria, where it has since engaged in ambulance service in time of war. The bailiwick of Utrecht still exists, having survived the decree of Napoleon, but the Dutch representatives of the order have become Protestants. See CRUSADES; GERMANY; PRUSSIA; RELIGIOUS ORDERS.

Teutonic Order, The. See ORDERS, ROYAL.

Teutonic Race. See GERMANY.

Tewfik Pasha, tū'fĭk păsh'ȧ, **Mohammed,** khedive of Egypt: b. 15 Nov. 1852; d. 7 Jan. 1892. He was declared heir apparent in 1866, when the sultan granted the right of primogeniture to the Egyptian reigning family, and in 1879 he succeeded to the throne on the abdication of his father, Ismail Pasha. He was a ruler chiefly in name, the control of the government being virtually in the hands of foreign powers. A national party was formed of which Arabi Pasha, minister of war, was at the head, and the friction between the khedive, who favored the English, and Arabi resulted in an insurrection in 1882. Through the intervention of England the uprising was quelled and a species of constitutional monarchy was adopted, giving an English financial adviser a place in the council in 1883. During the Mahdi troubles in 1884 Tewfik was forced to give up the Sudan. He was a man of simple tastes, married but one wife, and was deeply interested in educational advancement and in the improvement of public works.

Texarkana, tĕks-ăr-kăn'a, Arkansas and Texas twin city, one in Bowie County, Texas; the other the county-seat of Miller County, Ark.; on the Saint Louis, I. M. & S.; Kansas City S., or "Port Arthur Route"; Saint Louis & S., or "Cotton Belt Route"; Texas & P.; Texarkana, S. & N.; and Texas C. R.R.'s: about 180 miles southwest of Little Rock, the capital of Arkansas, and 28 miles north of the Louisiana boundary. The cities are separated by the boundary between Texas and Arkansas, but they are one commercially, industrially, and in all except the city governments. The name indicates unity; the first syllable is from the first syllable in Texas, the second from the first syllable in Arkansas, the last two from the last two syllables in Louisiana. Both the cities were settled in 1873; became incorporated towns in 1880, and cities of the second class in 1887. Texarkana, Ark., became a city of the first class in 1904. The post-office, situated across "State Line," serves for both cities, and is designated as "Texarkana, Ark-Tex." The cities are in an agricultural and lumbering region, and are an important distributing centre for a large extent of country. The chief industrial establishments are railroads and railroad shops, employing about 1,500 persons, lumber works, 500 employees, and other manufacturing establishments having a total of about 2,500 employees. There are about 500 carpenters and builders, and about 500 persons engaged in mercantile pursuits. Two large creosoting plants are near the city. Cotton and cotton products, lumber, grain, and live stock are shipped from Texarkana in large amounts. The principal public buildings are the Government building, the Miller County, Ark., court-house and jail, the Y. M. C. A. building, Railroad Hospital (cost $200,000), sanatoriums, and the churches and schools. The United States court for the Western District of Kansas and United States court for the Eastern District of Texas, each hold annually, two regular terms in the city within the district.

There are 31 churches, representing 17 different denominations. In each city are a high school, grammar schools, kindergartens, and parish schools. Saint Agnes Academy, in Arkansas, was established in 1877; Saint Rose of Lima Academy is in Texas; Texarkana Industrial College opened in 1904. There are three national banks, having a combined capital of $300,000, and annual clearings amounting to $15,000,000. Two trust companies with combined capitals of $110,000 were established in 1904. The majority of the inhabitants are American born; about 650, foreign born, and 4,200 of negro descent. Pop. (Ark.), (1890) 3,528; (1900) 4,914; (Tex.), (1890) 2,852; (1900) 5,256. Since 1900 the cities have grown considerably and the estimated population of each city (1904) is 8,000. G. A. HAYS.

Texas, a south central State of the United States, the largest in area in the Union; popularly known as the "Lone Star State." It is bounded by the Gulf of Mexico on the southeast, by Louisiana and Arkansas on the east, by Arkansas and the Indian Territory and Oklahoma on the north, by New Mexico on the west and north, and by Mexico on the southwest. Its location is between lat. 25° 51′ and 36° 30′ N., and between lon. 93° 27′ and 106° 43′ W. The State has an area of 265,780 square miles. Its greatest length is 825 miles, and breadth 740 miles, with a coast line of 400 miles. Texas was admitted to the Union 29 December 1845, and has 246 counties: the capital is Austin. The population in 1900 was 3,048,710.

Topography.—The surface of Texas is of varied aspect, the prevailing elements being steppes or treeless plains in the northwest, mountains west of the Pecos River, forests in the east, marshes adjacent to the coast, low prairies in the southeast, and a combination of prairies and broken hills, interspersed with forest growth and thickets of chaparral in the centre. The treeless region of the northwest, a continuation of the plateau at the base of the Rocky Mountains, is broken into hills along its eastern margin or scarp. This is succeeded by plains of a lower elevation followed by the broken scarp or edges of strata inclined toward the Gulf

Coastal plains extend inland from 20 to 80 miles, are furrowed with deep ravines, and consist for the most part of rich prairie or forest land: the hilly region behind this is formed chiefly of sandstone and limestone ridges, separated by valleys of considerable fertility. A long chain of lagoons stretches along the Gulf of Mexico. The principal bays are those of Galveston, Matagorda, San Antonio, and Corpus Christi.

Rivers.—There are several large rivers in Texas flowing southeastward to the Gulf of Mexico. The Canadian and Rio Grande rivers rise in the Rocky Mountains, while the Pecos, Brazos, Red, Colorado, Sabine, San Antonio, Neches, Trinity, San Marcos, and Guadalupe rivers rise along the eastern border of the Llano Estacado. The streams in the northern part of the State belong to the Mississippi system. The Canadian River is a tributary to the Arkansas. The Red River rises on the Llano Estacado and forms a part of the northern State boundary. The rivers flowing directly to the Gulf of Mexico empty through estuaries, and, with the exception of the Brazos, into coast lagoons. In general, the rivers are not adapted for navigation. Neither do they afford much available water power north of Austin.

Climate.—The State has a warm, dry climate. The rainfall varies from an average of 5 inches in the extreme south to 60 inches in the northeast. The average at Austin is 33 inches. The annual mean temperature for the State is 66.2°. The mean for July at Galveston is 83.7° and at El Paso 81.9°. The corresponding figures for January are 52.7° at Galveston and 44.5° at El Paso. On the coast the temperature seldom falls below freezing. In the western uplands, the temperature rises above 100°, while on the coast the maximum is between 90° and 95°. In winter there are severe north winds, which often lower the temperature 50° in a few hours.

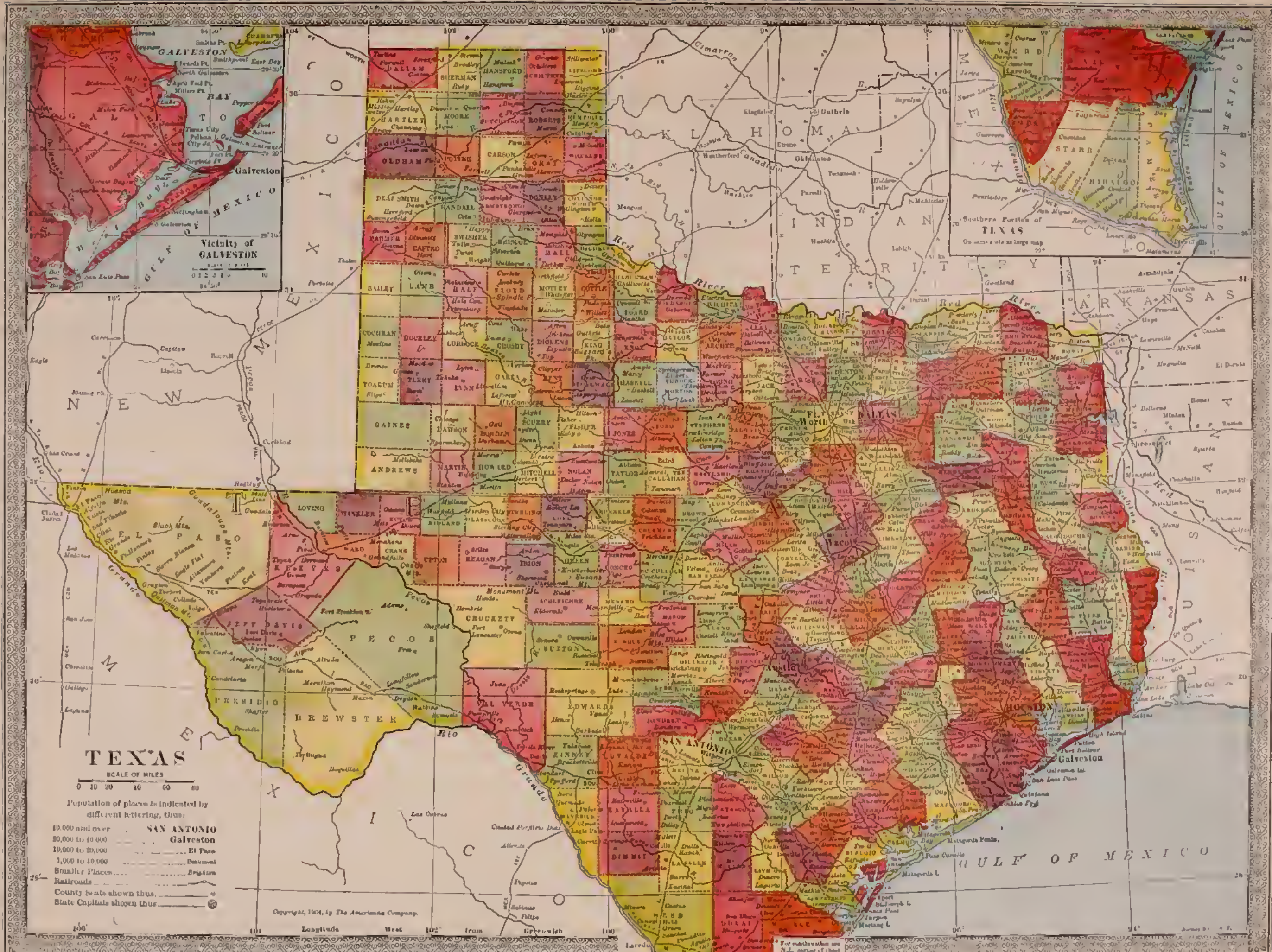
Geology.—With few exceptions the entire geologic series is represented in this State. The Palæozoic rocks include the pre-Cambrian, the Cambrian, and the Ordovician, up to the Trenton. The carboniferous rocks are exposed in two widely separated portions of the State. The Cretaceous is the most conspicuous of the geologic formations of the State. The lower member of the series is unknown elsewhere in the United States, and its peculiar features give individuality to the central region. The Upper Cretaceous strata are also well exposed. The rocks of Texas, except the Palæozoic groups, are soft, and yield readily to disintegration. A few eruptive sheets are found in the trans-Pecos region and a few basaltic outbursts in the Rio Grande Plain, being remnants of the eastern edge of the great eruptive area of the Rocky Mountain region. Granite masses occur, as extrusions from the pre-Cambrian, in the central and trans-Pecos Palæozoic deposits. The mountains in Texas are situated west of the Pecos River. The principal ranges are the Guadalupe, Limpia, or Davis, Chinati, Los Chisos, Organ, and Franklin. The most eastern and northern of these are usually the highest. Guadalupe Peak is 9,000 feet: Davis Peak and the crest of the Chinatis, from 3,500 to 8,000 feet; Eagle Mountains, 7,000; and the intervening valleys from 3,500 to 5,000 feet. Considerable beds of bituminous coal occur in the central portion of the State. There are also deposits of lignite, iron, copper, lead, tin, silver, cinnabar, limestone, and gypsum. In the southeastern part of the State immense petroleum deposits have been found.

Flora.—The area of Texas is so extensive and its conditions of rainfall and temperature so varied that there is necessarily great variety in both the flora and fauna of the State. The forest district is largely in the eastern part of the State where are found the long- and short-leaf pine, with many species of oak and hickory. The river valleys are well timbered with pecan, cypress, cottonwood, and several species of oak. The highlands are covered with oak and cedar. On the summits of the Guadalupe and Davis ranges, in the Pecos region, are forests of the yellow, flexible, and nut pine, all of which attain fair size. The Rio Grande Valley grows many species of cactus and other prickly, coriaceous shrubs. The arboreal flora of Louisiana and Arkansas extends into northeastern Texas. The osage orange is common in the northeastern part in the counties along Red River, and the mesquite west of a line drawn from Dallas to Galveston. The forest area is estimated at 64,000 square miles.

Fauna.—Texas contains representatives of the Transition, Upper and Lower Sonoran, and Tropical faunas. Among the commonest animals are the prairie dog, jack rabbit, skunk, opossum, and coyote. The wild bison is extinct, and the panther, bear, deer, and antelope are disappearing except in certain favorable localities. On the Rio Grande border are some Mexican species such as the peccary and armadillo, and in the extreme southern part of the State, tropical species, such as the ocelot and jaguar. Among the common birds of the State may be mentioned the mocking-bird, scissor-tailed flycatcher, lark-sparrow, dove, quail, turkey buzzard, five or six species of woodpeckers, and nearly all the ducks of the United States. Among the common reptiles are the horned frog and many other species of lizards, the rattlesnake, moccasin, garter snake, pilot, and bull snake. Fishes are represented by several va-

FARMS AND FARM ACREAGE: 1850 TO 1900.

Year.	Number of farms	Number of acres in farms			
		Total	Improved	Unimproved	Average
1900	352,190	125,807,017	19,576,076	106,230,941	357.2
1890	228,126	51,406,937	20,746,215	30,660,722	225.3
1880	174,184	36,292,219	12,650,314	23,641,905	208.4
1870	61,125	18,396,523	2,964,836	15,431,687	301.0
1860	42,891	25,344,028	2,650,781	22,693,247	590.9
1850	12,198	11,496,339	643,976	10,852,363	942.5


TEXAS
SCALE OF MILES
0 10 20 40 60 80
Population of places is indicated by different lettering, thus:
10,000 and over SAN ANTONIO
20,000 to 40,000 Galveston
10,000 to 20,000 El Paso
1,000 to 10,000 Beaumont
Smaller Places Brighton
Railroads
County Seats shown thus
State Capitals shown thus
Copyright, 1904, by The Americana Company.
Longitude West from Greenwich
Vicinity of GALVESTON
Southern Portion of TEXAS
GULF OF MEXICO
NEW MEXICO
OKLAHOMA
INDIAN TERRITORY
ARKANSAS
LOUISIANA
MEXICO
SAN ANTONIO
Galveston
Austin
Houston
Dallas
Ft. Worth
PECOS
BREWSTER
PRESIDIO
EL PASO
JEFF DAVIS
CROCKETT
OLDHAM
DEAF SMITH
GAINES
ANDREWS
LOVING
WINKLER
UPTON
REAGAN
SUTTON
DIMMIT
STARR

rieties of catfish, the black bass, and white and sun perch. On the coast the principal food fish is the red snapper, and the principal game fish the tarpon. Among the articulates are the crab, prawn, crayfish, centipede, tarantula, and scorpion.

Agriculture.—Texas has a total land area of 262,290 square miles, or 167,865,600 acres, of which 125,807,017 acres, or 74.9 per cent, are included in farms. There are a great many varieties of soil, nearly all excellently adapted to grazing. The prairies have in general a sandy loam, the interior a heavier brown and black loam, while in the northern part of the State are great areas of red lands. In the waste portions are cacti and thorny mesquite chaparrals. The preceding table gives, by decades since 1850, the number of farms, the total and average acreage, and the per cent of farm land improved.

The number of farms reported in 1900 was nearly 30 times as great as the number in 1850, and 54 per cent greater than in 1890. The total acreage of farm land has increased rapidly, being twice as great in 1900 as in 1890. The total value of farm property in 1900 was $962,476,273. In 1890 the amount was $516,977,333. The average size of farms in the State is 357 acres. In 1900 81.4 per cent of the farms of the State were operated by white farmers and 18.6 per cent by colored farmers. The chief crops of the State are cotton, corn, wheat, oats, sweet potatoes, sugar, cottonseed, hay, and forage. The statistics for 1900 are as follows:

Crops	Acres	Unit of measure	Quantity	Value
Corn	5,017,690	Bushels	109,970,350	$34,424,871
Wheat	1,027,947	Bushels	12,266,320	7,051,477
Oats	847,225	Bushels	24,190,668	5,240,791
Rice	8,711	Pounds	7,186,863	224,387
Kafir corn	22,813	Bushels	482,096	130,012
Hay and forage	938,024	Tons	1,494,305	7,294,450
Cottonseed		Tons	1,262,651	12,396,591
Cotton	6,960,367	Bales	2,506,212	84,332,713
Tobacco	1,443	Pounds	550,120	104,694
Peanuts	10,734	Bushels	184,860	178,542
Dry Pease	33,974	Bushels	333,462	349,306
Potatoes	21,810	Bushels	1,342,316	725,145
Sweet Potatoes	43,561	Bushels	3,299,135	1,689,018
Onions	1,639	Bushels	187,720	150,675
Miscellaneous Vegetables	110,260	.....	.....	5,109,963
Sugar cane	17,824	Tons	170,485	.....
Sorghum cane	26,803	Tons	88,933	263,518
Sorghum syrup	.....	Gallons	877,232	291,272
Small fruits	3,904	.....	.....	304,680
Grapes	2,213	Centals	40,862	126,355
Orchard fruits	121,797	.....	.....	1,345,423
Flowers and plants	167	.....	.....	120,249
Nursery products	2,093	.....	.....	314,511

The average values per acre of the various crops are as follows: Flowers and plants, $720; nursery products, $150; onions, $92; small fruits, $78; tobacco, $73; grapes, $57; miscellaneous vegetables, $46; sugarcane and sugarcane products, $41; sweet potatoes, $39; potatoes, $33; sorghum cane and sorghum syrup, $21; peanuts, $17; broom corn, $16; dry beans, $14; cotton and cottonseed, $14; orchard fruits, $11; dry pease, $10; hay and forage, $8; and cereals, $7. The crops yielding the highest average returns per acre were grown upon very highly improved land. Their production requires a relatively great amount of labor, and large expenditures for fertilizers.

Stock Raising.—Texas has more cattle within her boundaries than any State in the Union, and ranks second in the value of her live stock. In 1900 the value of live stock on farms and ranges was $240,576,955, or 25 per cent of the total value of farm property. Of this amount, 59 per cent represents the value of neat cattle other than dairy cows; 14 per cent that of horses; 10 per cent that of mules; 8 per cent that of dairy cows. In the same year the value of domestic animals not on farms was $8,133,526, and the total value of domestic animals in the State, exclusive of poultry and bees not on farms, was approximately $248,710,481. The statistics for 1890 and 1900 show live stock raising as follows:

Stock	1900	1890
Dairy cows	861,023	1,003,439
Other cattle	8,567,173	5,198,113
Horses	1,269,432	1,026,002
Mules and asses	523,690	227,432
Sheep	1,489,940	3,454,858
Swine	2,665,614	2,252,476

The apparent decrease in dairy cows is due to a change in enumeration, there being twice as much milk produced in 1900 as in 1890. The number of mules more than doubled during the decade. The number of sheep decreased nearly two thirds in the same period, sheep grazing giving way to cattle raising.

Irrigation.—Texas with its vast area and greatly diversified topography and climate contains areas well adapted to the successful cultivation of a wide variety of agricultural products. As the larger part of the State belongs to the humid region, irrigation heretofore has never been a prominent factor in agricultural development. The arid region may be described as belonging to the drainage basin of the Rio Grande and Pecos rivers, and includes the counties of Pecos, Reeves, El Paso, Jeff Davis, Brewster, and Ward. The soil, particularly in the valley of the Rio Grande, is of exceeding fertility when sufficiently watered, and is adapted to the cultivation of almost all the agricultural products of the temperate and sub-tropical climates. In this valley irrigation is of ancient origin, and on many of the canals the methods of irrigating have undergone little change. In 1900 the number of irrigators in arid Texas was 429;

the ditches had a length of 212 miles, and the cost of construction was $407,635. El Paso County, with six large canals having a total length of 92 miles, leads all others in the number of irrigators and in the mileage of ditches. There are a number of irrigation systems in the valleys of the Colorado and Brazos rivers, several of considerable importance, used in the cultivation of forage crops, grain, orchard, and small fruits. Many crops in this section were seriously damaged by severe floods in June 1899, and many irrigation plants were entirely destroyed. Some of the most important canals are at Menardville, San Angelo, Barstow, Del Rio and Junction City. During 1900 in Tom Green and Menard counties there were 157 irrigators, operating 17 plants, costing $84,325, having a length of 69 miles, and irrigating 7,563 acres. The total value of all crops produced on irrigated land in 1900 was $539,212, divided as follows: Rice, $224,315; hay and forage, $101,569; cereals, $64,107; vegetables, $99,240; orchard fruits, $17,175; small fruits, $1,134; all other crops, $31,672. Since 1900 rice irrigation in southern Texas has been greatly developed, and large canal systems now take the water necessary for irrigation from the Neches, Pine Island Bayou, the Trinity, the Brazos, the Colorado, and the Guadalupe, while hundreds of smaller farms are irrigated from surface wells.

Manufactures.— In 1900 there were 12,289 manufacturing establishments in Texas with an invested capital of $90,433,882. The value of manufactured products for 1900 was $119,414,982, to produce which involved an outlay of $3,229,075 for salaries of officials, clerks, etc.; $20,552,355 for wages; $6,144,924 for miscellaneous expenses, including rent, taxes, etc.; and $67,102,769 for material used, mill supplies, freight, and fuel. In 1890 there were but 5,268 establishments with an invested capital of $46,815,181 and a total product valued at $70,433,551. Manufacturing is chiefly the result of the State's abundance of raw materials, especially lumber, cotton, and wheat, the leading industries being those which are more or less dependent upon these materials. The large area of the State, and the heavy freight charges tend to encourage local production, while abundant fuel is available for power in the vicinity of Fort Worth and Dallas.

The cotton belt in Texas extends from Travis County, near the centre of the State, in a northeasterly direction to Grayson, Fannin, and Lamar counties, bordering upon Indian Territory. The ginneries in the counties of this belt handled 38 per cent of the entire cotton production of the State in 1900. Three of the largest ginneries in the United States, ginning annually over 7,000 round bales, are located at Waco, Farmersville, and Granger, and in the average size of its ginneries Texas is exceeded only by Oklahoma and Indian Territory. Nowhere, except in these territories, are automatic gins so largely used, or have the ginneries so generally adopted the custom of pressing the cotton after ginning into the so-called "round bales." This process was first introduced in 1894, in Texas, and since then has been very widely adopted in other States. "Round bales" are ready for shipment when they leave the ginnery, and the work of cotton compressors is therefore dispensed with. Of the 93,325,729 gallons of cottonseed-oil produced in the United States during the census year 24,354,695 gallons, or 26 per cent, were produced in Texas. Large quantities of this oil are shipped each year from Galveston to Mediterranean ports. The cake and meal are not so largely used as fertilizers in Texas as they are in the cotton States east of the Mississippi River. This is due to the more recent development of the Texas soils, and the greater demand in this State for cottonseed meal and cake as food for cattle. It is estimated that 500,000 cattle are annually fattened on hulls and meal in the cotton States west of the Mississippi River. In the manufactures of the State, in cities, during the decade from 1890 to 1900, Houston shows the greatest growth, the value of products having increased from $6,832,943 in 1890 to $10,641,575 in 1900. In Dallas, the leading manufacturing city, the number of establishments increased from 312 to 373; the number of wage-earners from 3,554 to 3,756, and the value of products from $9,054,766 to $11,480,499.

The leading industries are as follows:

Industries	Number of establishments	Average number of wage earners	Value of products
Total for selected industries for State	5,793	30,119	$73,024,636
Cars and general shop construction	56	6,633	8,314,691
Clay products	171	1,859	1,212,266
Cotton, ginning	3,222	4,295	5,886,923
Flouring and grist-mill products	289	705	12,333,730
Foundry and machine shop products	99	1,343	2,682,426
Liquors, malt	9	585	2,689,606
Lumber and timber products	637	7,924	16,296,473
Lumber, planing mill products	76	657	1,605,297
Oil, cottonseed and cake	103	2,478	14,005,324
Printing and publishing	772	2,547	4,577,110
Saddlery and harness	359	1,093	3,420,790

Mining.— Since 1900 mining has made remarkable progress, and promises large development. In 1901 the output of coal was valued at $1,907,024, there being mined 787,700 short tons of bituminous coal and 296,681 short tons of lignite. The production of petroleum, which practically began in 1898, has increased very rapidly, amounting to 4,393,658 barrels in 1901. Silver mined in 1901 was valued at $283,440. Brick and tile made from local clays amounted to $1,632,189. Gypsum, cinnabar, granite, sandstone, and limestone are quarried very profitably.

Transportation.—In 1868 there were less than 500 miles of railroad in the State, while in 1902 the total mileage was 10,078, of which 325 miles were constructed during the previous year. The leading railroads are the Southern Pacific, the Gulf, Colorado and Santa Fé, the Missouri, Kansas and Texas, the International and Great Northern, the Texas Pacific, the Houston and Texas Central, the San Antonio and Aransas Pass, and the St. Louis and Southwestern. The State Railroad Commission is authorized to

adopt all necessary rates, charges, and regulations; to govern and regulate traffic; to correct abuses and prevent unjust discrimination and extortion; to classify and subdivide freight, etc. Steamship lines connect Galveston, the chief Gulf port, with the most important seaports of the world.

Commerce.—The principal exports are cotton, wool, and hides, most of which are shipped from Galveston. The chief imports are manufactured articles used in the State, also coal and railway material. In 1900 the imports of merchandise at the ports of Brazos de Santiago, Corpus Christi, Galveston, Paso del Norte, and Saluria, aggregated in value $5,113,450; and the exports, $114,164,710. The imports of gold and silver amounted to $15,633,499, and the exports, $28,592. The receipts for internal revenue in the State in 1900 amounted to $1,521,474.47.

Banks and Banking.— Prior to the Civil War private banks were in vogue, and not until 1871 did the State Legislature pass a free banking law. In 1902 there were 288 national banks in operation, having $22,570,510 in capital, $9,659,463 in outstanding circulation, and $9,192,480 in United States bonds. There were also 33 private banks, with $1,108,744 in capital, and $274,746 surplus. The exchanges at the United States clearing houses at Fort Worth, Galveston, Houston, and Dallas, for the year 1901, aggregated $1,282,206,530; an increase over those of the preceding year of $215,065,993.

Government.—The State affairs are conducted under a constitution adopted in 1876. The officials include the governor, attorney-general, comptroller, treasurer, commissioner of the general land office, and superintendent of education, elected biennially, with a secretary of state, a commissioner of agriculture, insurance, statistics, and history, and an adjutant-general appointed by the governor. The judiciary, which is elective, consists of two courts of final appeal, one for criminal, the other for civil business, five courts of civil appeals, 63 district courts having original jurisdiction in the more important criminal and civil cases; a county court with original jurisdiction over minor misdemeanors and civil cases in each organized county; and a large number of justice courts with jurisdiction over petty misdemeanors and civil cases. The legislature consists of 31 senators elected for four years, and 133 members of the house of representatives elected for two years. It is restricted by the constitution to one session biennially unless called together by the governor. During the regular sessions, the members of each house get five dollars per day for sixty days and two dollars per day thereafter. During the called sessions they are paid five dollars each per day. The State is divided into 16 congressional districts. Voters must have resided one year in the State and six months in the district where the vote is cast; and if financial measures are voted upon, taxpayers alone are allowed to vote.

State Finances.— In 1901 the bonded debt of the State was $3,989,400, and its taxable wealth $946,320,258. The aggregate debt of all the counties and cities was $6,839,739. The homestead and exemption laws are unusually liberal to the debtor. The assessed valuation in 1901 was real estate, $666,904,488; personal property, $247,103,146; total valuation, $914,007,634. There were also franchises valued at $32,312,624. The income of the State is derived mainly from a general property tax and sale and lease of public land. The State's receipts in 1901 amounted to $8,744,000; disbursements, $7,104,000; cash balance, $2,200,000.

Charities and Correction.— There are insane asylums under State control located at Austin, San Antonio, and Terrell, with a total of 4,000 inmates in 1902. At Austin there is a school for deaf and dumb whites, one for blind whites, and one for colored deaf, dumb, and blind. The State Orphans' Home at Corsicana, the Epileptic Colony at Abilene, and the Confederate Soldiers' Home at Austin are other well-known institutions. The farm convict system has long been in vogue in this State. There are State penitentiaries at Rusk and Huntsville with convicts to the number of 4,600. There is also a reformatory at Gatesville for youthful offenders. The State owns two large farms for male convicts and smaller ones for female convicts. Convicts are also worked upon the share rent system, while others are leased to farmers or for railroad work.

Education.—The public free school system consists of three normal schools for the training of white, and one for the training of colored teachers, and numerous district schools, open, on an average, about 5⅓ months in the year. In most of the cities the State fund is supplemented by local taxation. In 1900 there were 1,070,000 children within school age, and the cost of the maintenance of the whole system was $4,500,000. The actual enrolment in public schools was 552,503, with a daily average attendance of 393,780. In 1900 there were 11,133 public school buildings; public school property valued at $9,166,550; and 15,000 teachers. For higher education for whites there were 201 public high schools, a large number of private secondary schools, the University of Texas (q.v.) at Austin, with its medical branch at Galveston, the Agricultural and Mechanical College at Bryan, the State normal schools for whites at Huntsville, San Marcos, and Denton, that for colored at Prairie View, the Girls' Industrial College at Denton, and the following denominational institutions: Fort Worth University, Southwestern University at Georgetown, Austin College at Sherman, Baylor University at Waco, Texas Christian University at Waco, and Trinity University at Waxahachie. Except for the Girls' Industrial College, whose name characterizes its students, and the Agricultural and Mechanical College and Austin College, which are for young men, the institutions specifically enumerated here are coeducational.

Religion.— In numerical order the religious denominations are represented as follows: Baptists, Methodists, Roman Catholics, African Methodists, Disciples of Christ, Presbyterians, Lutherans, Episcopalians. The Baptists and Methodists aggregate over two thirds of the church membership of the State. The Roman Catholics constitute about 5 per cent of the population. In 1900 there were 4,000 Evangelical Sunday Schools, 30,000 officers and teachers, and 250,000 scholars. The negroes are mostly Methodists and Baptists.

Population.— In 1860 Texas had a total population of 601,039; in 1870, 818,379; in 1880, 1,592,474; in 1890, 2,235,523; in 1900, 3,048,710. Of this last-named total 1,578,900 were males,

and 1,469,810 were females; 2,869,353 were natives of the United States and 179,357 foreign born. There were 620,722 Negroes, 836 Chinese, 470 Indians, and 13 Japanese. Of the entire population 522,133 persons were engaged in occupations as follows: in agriculture, 359,317; in law, medicine, and other professions, 97,651; in trade and transportation, 34,909; in manufacturing and mining, 30,346. At the same date 13.9 per cent of the native whites, 24.7 of the foreigners, and 75.4 per cent of the negroes — or 29.7 per cent of the entire population — were unable to read or white. In 1900 there were 36 cities having over 4,000 inhabitants each. The cities with more than 10,000 inhabitants were, San Antonio (53,321); Houston (44,633); Dallas (42,638); Galveston (37,789); Fort Worth (26,688); Austin (22,258); Waco (20,686); El Paso (15,906); Laredo (13,429); Denison (11,807); Sherman (10,243).

History.— Texas first claims the attention of the historian as the object of a contest between the French and Spaniards in the extension of their respective boundaries in North America. It had previously been crossed by Cabeza de Vaca in the south, by Coronado in the northwest, and by others, and in 1682 an Indian pueblo had been formed under Spanish protection at Ysleta, a few miles distant from where El Paso now stands. The immediate occasion of the contest between the French and Spaniards for possession was an accident. After La Salle had followed the Mississippi River to the Gulf of Mexico in 1682, he went to France and organized an expedition to plant a colony at the mouth of the river and begin the attempt to secure control of the valley which it drains. The expedition, however, missed its proper destination, and a landing was made early in 1685, on the coast of Matagorda Bay. There La Salle established a settlement which he called Fort Saint Louis. It survived for only about four years, when it was destroyed by the Indians. In the meantime, the Spaniards had been searching for the establishment with the intention of destroying it themselves, but they failed to reach it till the work was done. Now, in order to forestall a repetition of the French movement, they made a weak effort to secure their hold on the country by means of missions. The first of these was founded in 1690 between the Neches and Trinity rivers, about 45 miles southwest from the present town of Nacogdoches, in a district occupied by a confederacy of Indian tribes who called each other by the common appellation, "Tejas." The district was therefore known by the Spaniards as that of the Tejas, or simply Tejas, or Texas (both forms having in Spanish the same pronunciation). The mission, the name of which was San Francisco de los Tejas, was abandoned in 1693, and no further effort to occupy Texas was made for about 20 years. Then Antoine de Crozat, who had been granted a monopoly of trading privileges in Louisiana, sought to improve their value by establishing a trade with Texas. In 1714 he sent a young French officer, Huchereau de Saint-Denis, to that country for the purpose. The result was that Texas was practically surrendered to the Spaniards in order that they might be near enough to the French in Louisiana to engage in trade. From this time forward for more than a century the Spaniards held undisputed possession. They founded two groups of missions, one in the east, the original Texas, and one in the west. The western group was mostly in and near the district covered by the modern city of San Antonio; but two of the missions, La Bahia and Refugio, lay southeast of San Antonio, near the coast. In 1731 three of the six eastern missions were moved to the western group, and in 1772 the other three were also moved thither. This left the original Texas unoccupied by Spaniards for a time, but a few years later a body of them went back into that district and founded the villa of Bucarcli, which was first located on the Trinity, and after 1778 at or near the present town of Nacogdoches. In 1730 the first civil settlement in Texas was founded. It was the villa of San Fernando. Its settlers were Canary Islanders, and the location was at Béjar. This villa, the mission of San Antonio de Valero (the Alamo), and the *presidio* of San Antonio de Béjar, were the original elements of the city of San Antonio. During the latter part of the 18th century the missions declined steadily, and in 1794 their secularization was ordered. In 1810 a rising against the Spanish government was begun by Hidalgo, and subsequent to his death it was carried on by others, till, after two or three years of apparent suppression, it culminated in 1821 in the independence of Mexico. There resulted first a provisional government, then an imperial under Iturbide, and finally in 1824, a federal republic. In this republic, Nuevo León, Coahuila, and Texas first composed a single state; but Nuevo León was soon separated from the group, leaving only Coahuila and Texas. About the end of the 18th century began the movement into Texas of the Anglo-Americans. This movement was first a series of invasions; but the Spanish policy of exclusion was given up just before Mexico became independent, and then followed a peaceful influx of immigrants brought in groups by contractors. The colonizing work was planned and begun by Moses Auston. It was not long after this movement was initiated till the immigrants began to have friction with the Mexican government, and this culminated in a revolution, which in 1836 made Texas an independent republic. The most notable event of the war which accomplished the freedom of Texas was the desperate defense of the Alamo (q.v.) by 183 Texans under Colonel W. B. Travis against several thousand Mexicans under General Santa Anna, in which the defenders were killed to a man. For nearly 10 years Texas remained independent, but in 1845 it was annexed to the United States and became a member of the Union. In 1861 it seceded and joined the Southern Confederacy. In the war that followed, the Federal troops obtained a foothold on the coast of Texas, but did not succeed in penetrating the interior. The Reconstruction government which succeeded the Civil War, was overthrown in 1874. Since that time, though the Populists attained considerable strength, 1894 and 1896, the State has been regularly Democratic by a large majority.

Bibliography.— Bancroft, 'North Mexican States and Texas' (1885); Brown, 'History of Texas' (1892); Foote, Texas and the Texans' (1841); Kennedy, 'Texas' (1844); Richardson, 'Texas Almanac' (1857–1873); Edward, 'History of Texas' (1836); Roberts, 'Description of Texas' (1881); Rhodes, 'Birds of Southwestern Texas' (1892); Raines, 'Bib-

1. The Alamo, San Antonio, built in 1718.
2. The Mission San José, near San Antonio, built in 1718.

liography of Texas' (1896); Spaight, 'Resources, Soil and Climate of Texas' (1882); Thrall, 'History of Texas' (1878); Lubbock, 'Six Decades in Texas' (1900); Wooten, 'History of Texas' (1898); Yoakum, 'History of Texas' (1856); Garrison, 'Texas,' in "American Commonwealth Series."

Texas Agricultural and Mechanical College, located at College Station, Brazos County, Texas. It was established in 1876, receiving 180,000 acres of land from the National government, in accordance with the land grant act of 1862. The government of the college is vested in a board of directors of eight members from different sections of the State, appointed by the governor for terms of six years. It offers four years' courses leading to the degree of B.S. in agriculture, horticulture, mechanical and civil engineering; there is also a course in veterinary science, and graduate work is provided for; in 1902 ten weeks' winter courses in stock-farming, dairying, and horticulture were added to the curriculum. These are designed to give practical instruction and training to those who cannot obtain a thorough college education; only men over 18 are admitted to these courses. The college farm and grounds contain over 2,000 acres, of which 350 are under cultivation; the grounds and buildings in 1903 were valued at $450,000; in 1902 a new chemical and veterinary science laboratory building was erected. The library in 1903 contained 5,600 volumes; the students 467, and the faculty 28.

Texas Bluegrass. See GRASSES IN THE UNITED STATES.

Texas Christian University, located at North Waco, Texas. It was founded as a private institution at Thorp's Springs, Texas, in 1875, and chartered under the name of Add-Ran College; in 1890 the college became the property of the Christian Church of Texas, and in 1895 it was moved to its present site, a suburb of the city of Waco, and the name was changed to Texas Christian University. The university now includes the following departments: (1) the Add-Ran college of arts and sciences; (2) the college of the Bible; (3) the college of business; (4) the college of music; (5) the school of oratory; (6) the school of art; (7) the preparatory school. The university is coeducational. There is a military department providing military drill; no secret societies are permitted, but the students maintain three literary societies and an athletic association. The campus contains 15 acres on high ground above the city; the buildings include the main building, the Young Ladies' Home, and Townsend Memorial Hall. The income in 1903–4 was $30,000; the library contained 5,000 volumes; the students in all departments numbered 400, and the faculty 25.

Texas Fever, in cattle. See RINDERPEST.

Texas, University of, the State university located at Austin, with the medical department at Galveston. The first step toward its establishment was taken in 1839, when the Congress of the Republic passed two acts, one setting apart land for a university campus in the future city of Austin and the other appropriating 50 leagues of unoccupied land for the purposes of university education. In 1858 the legislature provided for the organization of a State university, but the carrying out of this act was rendered impossible by the Civil War and the period of Reconstruction. The constitution of Texas as adopted in 1876 made further provision for establishing the university, appropriating 1,000,000 acres of land in place of the 50 leagues set apart in 1839. In 1881 the university was incorporated, its location was determined by popular vote, and in 1883 it was opened to students. Another 1,000,000 acres of land was appropriated in the latter year. It is the head of the public school system of Texas, and admits graduates of approved high schools without examination; it is open to men and women on equal terms. The government is in the hands of a board of regents, consisting of eight members from different parts of the State appointed by the governor with the approval of the senate, two every two years, for a term of eight years. The departments of the university are as follows: (1) the department of literature, science, and arts; (2) the department of engineering; (3) the department of law; (4) the department of medicine, including the school of pharmacy; (5) the summer schools. The Texas mineral survey was also organized under the charge of the university in 1901. The department of literature, arts, and sciences has conferred three bachelor degrees, A.B., B.L., and B.S.; in 1903 the policy of conferring the A.B. degree for all undergraduate courses was adopted, and no other baccalaureate degree will be conferred after June, 1905. The degree of A.M. is conferred for graduate work. The undergraduate courses have been largely elective, and the new A.B. course remains so; English and mathematics are prescribed in the first two years, and electives in at least one language, one science, political science, and a major subject are required. The department of engineering offers courses in civil and mining engineering, conferring the degree of civil engineer, and engineer of mines; some electives are allowed in the last two years of the civil engineering, according to the particular department in which the student wishes to specialize The department of law offers two and three years' courses, and confers the degrees of LL.B. and LL.M. Students in the department of literature, arts, and sciences, who intend entering the department of law, are allowed to take four elective courses during the college junior and senior years, and other students of that department are allowed three electives. The department of medicine offers a four years' course leading to the degree of M.D.; connected with this department are the school of pharmacy with a two years' course, and the John Sealy Hospital, owned jointly by the city and the university. There are two summer schools conducted at Austin, the University Summer School, and the University Summer Normal School; the former offers general courses of collegiate grade, satisfactory work being credited toward a degree; the latter is especially designed for teachers, and has courses in pedagogy, psychology, and history of education, and in English literature, science, algebra and other advanced studies of the school curriculum; instruction in elementary subjects is not included. There are a number of graduate fellowships,

and alumni scholarships, and several high school scholarships. The students maintain a students' association for dealing with certain questions of student government; also an Oratorical Association, literary and musical clubs. There is a University Co-operative Society, to membership in which both students and members of the faculty are eligible on payment of an annual fee of one dollar; this society provides books, stationery, athletic goods, etc., at the lowest possible price; articles are sold at uniform prices to all, but members of the society receive a rebate at the end of the year in proportion to the amount of their purchases. The campus at Austin includes 40 acres; the buildings on this campus are the main building, University Hall, and the Woman's Building. The medical department at Galveston occupies two buildings, one a woman's dormitory, besides the hospital. The scientific laboratories include a laboratory of pedagogy and psychology, and are well equipped. The general library in 1904 had 40,000 volumes, including the Palm Library, the Hilliard Library of Southern Literature, and other special collections; the law and medical departments also possess departmental libraries. The productive funds in 1903–4 amounted to $1,363,225; the students numbered 1,348 and the faculty 110.

Texcoco, tās kō'kō. See TEZCUCO.

Texel, tĕk'sĕl, Netherlands, an island in the Zuyder Zee, separated from North Holland by the Strait of Mars-Diep. Its area contains about 35,000 acres of fertile lands, which afford fine pasturage and fields for the growing of crops. Stupendous dikes protect the island. Sheep-raising is the chief industry, and the wool and cheese are noted products. Texel has an interesting war record. It was here that the celebrated victory of Admiral Blake was won over the Dutch in 1653. Another important battle was fought 1673, between united France and England against Holland. In 1797, the island was blockaded, and the Dutch fleet surrendered to Admiral Mitchell in 1799. Pop. (1899) 5,954.

Texier, tĕs-yā, **Charles Félix Marie,** French traveler and archæologist: b. Versailles, France, 29 Aug. 1802; d. Paris 1 July 1871. His works comprise 'Description de l'Asie Mineure' (1839–48); and 'Description de l'Arménie, de la Perse, et de la Mésopotamie' (1842–5).

Textile Industry, American. In 1800 there were no textile mills, as the term is now understood, in the United States. Whatever the American people did in the way of manufacturing their own clothing was mostly done in the household; the spinning wheel and the hand-loom were utensils as familiar in the old-fashioned kitchens as the pots and kettles of the housewife. The homespun garments worn by our forefathers were fashioned out of wool grown on the home farm, carded by hand-cards, washed in tubs, spun and woven by hand, fulled and finished at home, cut up and sewed — all by the joint labor of husband, wife, sons and daughters. The finer clothes worn in those days were all imported; and as the colonies grew and multiplied, and their consumption of English textiles increased, the manufacturers of the mother country foresaw a wondrous new market opening up before them. The desire to retain and increase that market for textiles, in the manufacture of which England already led the world, was far more prominent among the causes leading up to the American Revolution than its historians have yet discovered.

Colonial Homespun.— The homespun garments of colonial days were plain, and wore like iron; their ingredients were indicated in the name commonly applied to the cloth — "linsey woolsey." It was a fabric of woolen weft, woven on a linen warp. Linen was much more commonly produced in the household than cotton fabrics, and wool was more in use than all other fibres combined. Cotton was a scarce commodity in colonial America until long after the Revolution. It possessed a value equal to that of wool, and sometimes very much higher. What little of it was used prior to the 19th century was mostly imported from Barbados. When Samuel Slater started the first American cotton-mill at Pawtucket, in 1793, he insisted upon using cotton from the Indies, because of the poor quality of the cotton then raised at home. No one dreamed, when the "Shipping and Commercial List and New York Price Current" first made its appearance, that America was destined to become the cotton-producing country of the world; nor did Slater's little mill of 250 spindles, which had then been in operation five years, give signs that it was the germ of an American industry which would consume annually within 100 years more cotton than all the world was then growing. The history of the textile industries during the colonial period is nowhere suggestive of the development which confronts and amazes the student at the opening of the 20th century, who finds them, with their subsidiary industries, employing more capital and creating a greater value of annual product than any other group, except iron and steel.

Expedients of the Colonists.— Our forefathers realized how important it was that the colonists should learn to clothe themselves. They resorted to all sorts of expedients, some of which smack strongly of state socialisms, to overcome the difficulties in the way. They offered bounties to increase the number of sheep and promote the growth of flax. In Massachusetts laws were passed making it compulsory that each family should spin a given quantity of yarn every year, under penalties of heavy fines. Gradually the household textile industries assumed an importance which alarmed the mother country, and the lords of trade attempted by various restrictive orders to prevent and harass a development which threatened to destroy the colonial market for the chief products of British industry. Parliament passed an act in 1774 — which was shortly after the Arkwright inventions had inaugurated the modern factory system — forbidding the exportation, under heavy penalties, of any of the machines used in the cotton, silk, woolen, or linen manufacture. This statute, which remained in force, with certain modifications, until 1845, was evidence of a puerile hope that the English people could keep the fruits of inventive genius bottled up in their little island, while England permitted her sons to carry their brains across the water.

First Woolen Factory.— Slater brought his spinning machinery in his head; in the same way Arthur Scholfield, three years later, brought

the first wool-carding machine, which he built and put into operation at Byfield, Mass., in 1794, thus fixing the date of the beginning of the factory manufacture of wool by machinery operated by power in the United States. American machinists and inventors did the rest. It is not to be denied, however, that the English statute did retard, embarrass, and make trebly difficult the early development of our textile factories. A century ago the American textile industries were easily 100 years behind those of Great Britain.

Steps of Evolution.— It would be interesting to follow the evolution of the household industry, by slow and gradual steps, into the highly organized factory system of America to-day. First came the neighborhood fulling-mill utilizing the friendly services of the adjacent stream, and relieving the housewife of the labor of fulling and finishing the cloths and blankets accumulated by the busy shuttle during the long winter evenings. Then the carding-machine was added to the fulling-mill; the farmers for miles about brought their wool to be converted into rolls ready for the spinning-wheel. After Slater had successfully applied the Arkwright invention to the spinning of cotton at Pawtucket, here and there throughout New England little mills gradually appeared which spun both cotton and woolen yarns by water-power. Hand-looms were still used in all these mills until 1813, when the invention of a power-loom by Francis C. Lowell led to the building of the Waltham cotton-factory by the Boston Manufacturing Company, and the American textile mill first took on the characteristics which have since increasingly distinguished it. Power spinning and weaving machines were rapidly applied to the manufacture of woolens, and it began to be seen that the household manufacture of textiles was disappearing before the greater economy and efficiency of the factory system. The transition was not rapid, and the ups and downs of our first textile mills were numerous and discouraging.

War of 1812.— The outbreak of the War of 1812, and the non-intercourse acts and embargo which preceded it, were the most potent factors in completing the transition. The total suspension of importations threw our people suddenly upon their own resources for their entire supply of clothing. Cotton and woolen mills were quickly built. High prices and the promise of quick fortunes drew many men with little or no knowledge of manufacturing into the business. All went well enough until the war ended; then followed collapse and ruin. The work of laying the solid foundations of textile manufacturing had all to be done over again. Imported cottons and woolens again invaded the market with a rush, and the domestic manufacturers found it impossible to compete with them either in quality or in price. Labor was unskilled and hard to get; knowledge and experience were sadly wanting; machinery was clumsy and defective; the country was poverty-stricken, and trade and the national finances thoroughly demoralized.

First Protective Tariff.— Then first began the great battle in Congress, which has waged more or less intermittently ever since, for the protection of the domestic manufactures by means of tariff laws. The Tariff Act of 1816 —the first of the series in which the principle of protection was recognized in the rates fixed as a distinct purpose of the law, conjointly with the raising of revenue — was much more favorable to the cotton than to the wool manufacture, because it applied the minimum principle to cotton cloths, which was in effect a specific duty of 6¼ cents a yard, while the simple ad valorem rate of 25 per cent was applied generally to woolen goods. From the date of that law the cotton manufacture began a healthy development, and it naturally grew much faster than the wool manufacture. The later tariffs were in like degree, as a rule, more favorable to cottons than to woolens; partly owing to this fact and partly to other causes, such as the much more delicate, complicated, and expensive operations incident to the latter, the cotton manufacture has at all times except during the Civil War shown a greater prosperity and on the whole a more rapid development than its sister industry. But in both industries for many years it was an up-hill struggle against great odds. Few fortunes were made; many were lost; and the courage and tenacity of those early textile manufacturers deserve to be remembered.

From 1850.— In the last half of the 19th century there was an increase in the value of products of about six times, and not less than ten times if it were possible to measure this product by quantity instead of by value. Even the largest figures convey an inadequate idea of the relative importance of our textile mills in the industrial economy of the nation, for these mills supply the materials for a great group of subsidiary factory industries, such as the wholesale clothing manufacture, the shirt manufacture, etc. When we aggregate these, and add to them the value of the products of the linen, jute, hemp, and bagging mills of the country, we find that the product of our textile mills is larger in value than that of any single line of related industries, iron and steel excepted. The total most nearly approaching it is that of the iron and steel industries. The products of the textile mills and the factory products growing out of them are equal in value to more than one ninth of all our manufactures.

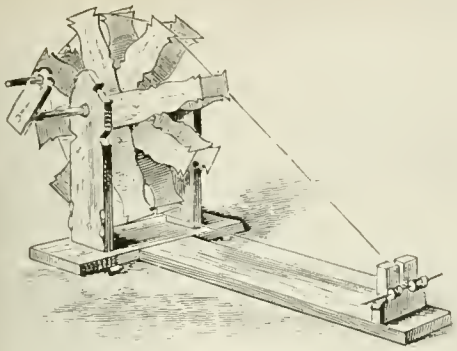
Machinery and Diminished Cost.— The decrease in the cost of goods during the last half century has been one of the most striking phases of the development. This decrease is due in some measure, of course, to the decreased price of the raw materials from which they are made; but in even larger measure is it due to the remarkable advance in the methods of manufacture — to the new and more perfect machinery employed, in the invention of which American mechanical genius has contributed certainly as much as that of any other people, and perhaps more. All the fundamental inventions in spinning-machinery were of English origin; so was the combing-machine and the power-loom. The English have a remarkable record in this respect, and the French and the Germans have also done much in the invention of labor-saving textile machinery. But the American record may be shown to surpass them all. The wool-carding machinery of all countries owes its chief improvement over the machines of a century ago to the invention of John Goulding of Worcester, Mass., whose patent, dated 1826, dispensed with the splicing-billy and

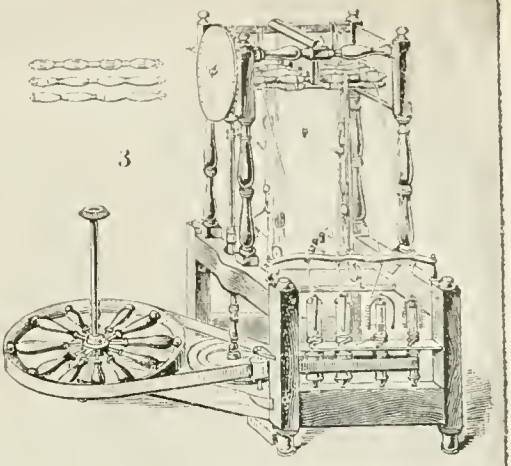
produced the endless roll or sliver. Michel Alcan, the distinguished French writer, describes it as "the most important advance in the wool manufacture of the 19th century." "It was not a step," he says, "but a flight." The modern cotton-spindle, making 10,000 revolutions a minute, is an evolution of our own mechanics. It has been shown that the saving effected by the new forms of spindle invented and adopted in the United States since 1870, when 5,000 revolutions a minute was the average speed, has been more than equal to the capacity of all the warp-spinning machinery in use in this country in that year, and to-day more than three times as much warp-yarn is spun in the United States as in 1870, a rate of increase without parallel since the earliest introduction of the cotton manufacture. The Lowell loom was the first successful application of power to the weaving of cotton, the Crompton loom to the weaving of fancy woolens, and the Bigelow loom to the weaving of carpets. "Not a yard of fancy woolens," wrote Samuel Lawrence, "had ever been woven by power-looms in any country until it was done by George Crompton at the Middlesex Mills in 1840." Every carpet ever woven was woven by hand until the power loom of Erastus Brigham Bigelow revolutionized the industry. Beyond these fundamental machines the American mechanisms for expediting processes, for automatic devices, for dispensing with intermediate help, have been so numerous that they have completely transformed the modus operandi of textile mills throughout the world. These mechanisms are more generally in use to-day in the best American textile mills than in those of any other country. So far as mechanical equipment is concerned, our best mills, whether cotton or woolen, are fairly equal to the best in any foreign country. It does not follow that textile manufacturing is done here, as a rule, with equal economy in cost.

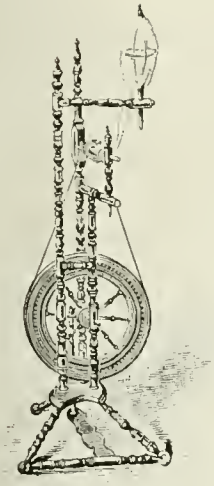
Mills and Equipments.— In structural equipment the modern American mill is in some respects superior to the average foreign mill. It is not so massive a structure, nor so solidly built, brick being used here, while the English generally use stone; but in the lightness and airiness of its rooms, in economy of arrangement and in general completeness of equipment and care for the comfort and convenience of the operatives, it is usually superior. The lesson is fast being learned by our textile manufacturers that in these days of close competition and small profits successful manufacturing requires that buildings shall be of the latest design and the most approved management, and that machinery shall not only be modern in make, with every latest improvement, but must also be kept in perfect condition by constant renewal. Many parts of the machinery required for the equipment of our textile mills are still necessarily imported from England, because not made, or less perfectly made, in the United States. This is true of some varieties of cotton machinery, and of most of the preparatory machinery of the worsted manufacture. Our machine manufacturers have been advancing as rapidly in recent years as the textile mills themselves, and the time cannot now be far distant when every new mill built in America will be equipped throughout with American-made machinery.

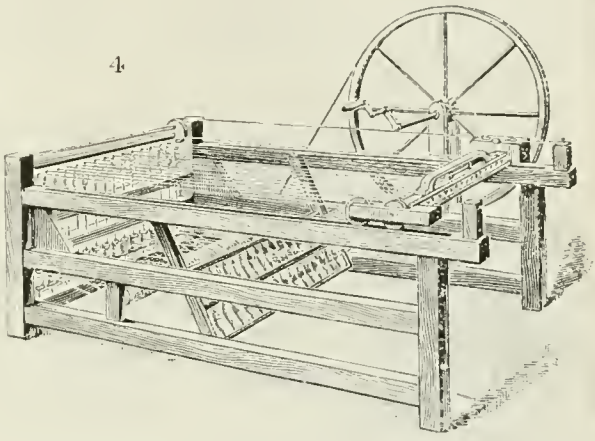
Variety of Fabrics.— The American textile mills now supply practically every variety of fabric made in the world, with the exception of linens and the very finest grades of other fabrics. Except crash goods, there are now no linen fabrics of any moment manufactured here. Great sums of money have from time to time been invested by daring manufacturers in constructing plants for the manufacture of linen fabrics. The result has invariably been disappointment and failure. If the obstacles were of a kind that ingenuity and perseverance could overcome, they would have been conquered. These obstacles are climatic in the first instance, flax being a fibre which requires more moisture than any other for its successful manipulation. Again, there is difficulty in obtaining a home supply of suitable raw material. Years of high protection have failed to persuade the American farmer into growing flax for fibre. The history of the linen manufacture in other countries seems to establish the fact that it is the one textile manufacture likely to remain segregated in a few localities like Holland and Ireland, where the fibre is grown on the spot, where the climate is peculiarly adapted, and where the help has acquired an expertness born of generations of experience. Moreover, linen is the one textile the consumption of which has not appreciably increased with the growing perfection of textile machinery. The quantity of linen fabrics made to-day is hardly larger than a century ago. The other fibres, less difficult to handle, more susceptible to cheap manipulation, continually encroach upon its uses. Turning from this single failure, we find extraordinary success in every other department of textile manufacturing.

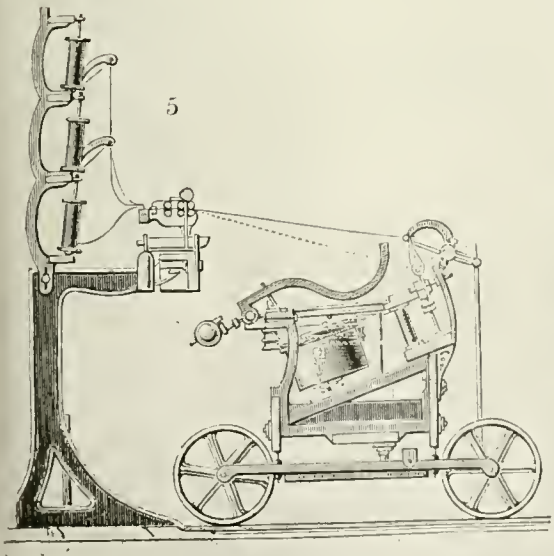
Silk Industry.— Perhaps the most striking contrast to our experience with linen is that afforded by the silk manufacture. At first sight it would appear that this must be the particular textile industry which could not flourish in America. Since the whirlwind of speculative excitement over the culture of the silkworm which swept New England in the thirties, and wrecked the fortunes of many too credulous farmers, we have settled down to the conviction that America cannot grow raw silk in competition with China, Japan and Italy. Moreover, the silk manufacture, like the linen, has always been highly specialized and localized. The city of Lyons, in France, had well nigh monopolized the manufacture, so far as it had escaped from the hand processes of the Eastern nations. The skill and taste of generations have been concentrated upon the production at these centres, of fabrics which in beauty of design, in richness of coloring, in delicacy of workmanship, alone among the fabrics made by modern machinery, rival the splendors of mediæval textile art. England has for centuries struggled in vain to place her silk manufacture on equal terms with it. Nevertheless we have built up in America, in the last 45 years, a silk industry which among machine-using nations is second only to that of France, and is to-day supplying our people with the bulk of the silken fabrics consumed by them. We owe this great achievement largely to the energy and the genius of the Cheney family, father and sons, of South Manchester, Conn. The Cheneys began the manufacture of spun silk, nearly half a century ago. About the same time, John Ryle, sometimes called the father of the American silk industry, had become

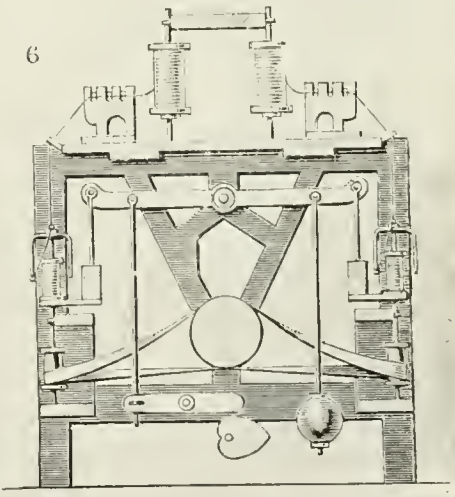












DEVELOPMENT OF SPINNING MACHINERY.

1. Indian Spinning-Wheel. 2. Saxony Spinning-Wheel. 3. Arkwright's Water-Frame.
4. Hargreaves' Spinning-Jenny. 5. Crompton's Mule. 6. Throstle

superintendent of a little silk-mill in Paterson, N. J., which he afterward purchased and gradually enlarged. At first sewing silks only were made, then ribbons were added, and in 1842 Mr. Ryle built a number of looms for silk piece-goods — the first to be successfully operated in America; and the industry in all its branches has since developed so rapidly there that Paterson, which calls itself the Lyons of America, now occupies to this industry the same relation that Fall River does to the cotton manufacture, and Philadelphia to the wool manufacture. During the Civil War the high duties stimulated the silk industry and diversified its product. The making of plain gros-grain dress silks was then started, and at the present time brocaded silks and satins are manufactured on a large scale; indeed there is no form of fabric into which silk enters which is not now produced in great variety. Especially noteworthy has been the recent development in the manufacture of silk plushes and all varieties of upholstery goods. The value of home-made silk goods was in 1880 just about equal to the foreign value of the goods imported. In 1890 the product had so grown that it was nearly double the value of the imports, and more than double the value of the product in 1880. During the next decade the rate of increase was accelerated. In Paterson is the largest silk-ribbon mill in the world. Another mill in that city, an outgrowth of the little mill operated by John Ryle, covers an acre and a half, and can nowhere be surpassed for size or completeness of equipment. See SILK AND SILK INDUSTRY (*Manufacture in the United States*).

Cotton.— The cotton manufacture must, on the whole, be taken as the textile industry which best illustrates the possibilities of this group of manufactures in the United States. The number of cotton-spindles in operation is over 21,000,000, the last ten years having shown a large increase, particularly in new mills at the South. The business is there conducted under so many advantages — particularly the cheapness of fuel and labor — that careful students of economic conditions predict that the manufacture of the coarser grades of cotton goods is destined to gravitate more and more to the Southern States. New England, and especially Massachusetts (which is the largest cotton-manufacturing State, containing about one third of the spindles in operation), has perhaps hastened such a transfer by the enactment of stringent labor laws and by increased taxation. Her manufacturers have looked with some apprehension upon the rapid growth of the industry in the South, chiefly through the aid of New England capital. Still thus far there has been no diminution in her machinery capacity, but, on the contrary, a steady increase, which, while relatively smaller than the increase in the South, continues to be actually greater. This is due primarily to the increased production of the finer grades of goods in New England, and secondarily to the rapid development of the country, with its enlargement of a market in which the South can share largely without injuring New England. Nevertheless the economic forces at work are of such a character that eventually a marked change in the geographical status of the industry seems inevitable.

Comparison with England.— From the national point of view, the important fact is that the growth of the American cotton manufacture for the last 25 years, both relatively and actually, has been greater than its growth in Great Britain. As compared with that of other countries the American cotton manufacture comes easily next to that of England, and shows a steady gain even upon the island which manufactures cotton for all the world except the United States. The American market for American cottons constantly expands with the growth of our own country, while our foreign markets show little gain. The English market as steadily contracts, as English and native capital builds new cotton-mills in Indian and Japan for the supply of the vast markets of the East. The casual student of first-class English and American cotton-mills, while he will observe certain differences, will not be able to detect any point of superiority in the former over the latter. He will find the English mills much more closely specialized, and he will find a larger proportion of them engaged upon the finer grades of goods. He will observe, also, that in the English mill mule-spinning is the predominating method, especially for fine numbers; while in the United States ring-spinning strongly predominates. This is due to the extraordinary advances in the mechanism of the ring-spinning frame, advances which are wholly of American origin, and which greatly cheapen the cost of production by increasing the product in proportion to the increased speed of the spindle. In mule-spinning, also, great advances have been made during the last 20 or 25 years. Whichever method is employed, the development of the industry has reached that stage where success depends upon the saving of a fraction of a cent in the price of a pound of cotton, and the economy of another small fraction of a cent in converting that cotton into yarn and cloth. To realize these fractions, which mean profit or loss, machinery must be kept in the highest state of efficiency.

Improved Spinning.— The improvements in spinning have been so rapid since 1870 that most of our large corporations have been compelled to replace their spinning-frames two or three times in that interval. A similar statement can be made regarding no other branch of textile manufacture; and it is probably true that if the American woolen mills had been forced, as the cotton mills have been, to abandon machinery as soon as it became in any degree obsolete, their ability to face foreign competition would be more nearly in keeping with that shown by our cotton manufacturers.

Large Corporations.— The conditions here narrated have thrown the cotton manufacture more and more into the hands of large corporations, which now almost universally conduct it. The wool manufacture, on the other hand, while it numbers some of the greatest corporations in the land, is still largely in the hands of individuals and partnerships, and the bulk of the mills are comparatively small in capacity. The more recent tendency in the wool manufacture, for obvious reasons, is strongly in the direction of the corporate form of management.

Fine Cottons.— The quantity of fine cotton goods made in American mills continues to be very small in comparison with the whole production, and the bulk of our consumption of this class of cottons is still imported. So there is ample room remaining for further development

of the American cotton manufacture. Into this field we are entering with characteristic Yankee energy. Within comparatively few years mills have been successfully established in New England which spin yarns as fine as Nos. 150 or 200; and there are mills at New Bedford, Taunton, and elsewhere which make, in wonderful variety, fabrics as delicate in texture and as artistic in design and coloring as any which reach this country from the machine-using nations of Europe.

Wool.— The range of products made in American wool factories is as wide as the multiform uses to which this most valuable of all the fibres is put. They divide themselves naturally into four great groups, leaving the hosiery and knit goods out of the classification: woolen-mills, worsted-mills, carpet-mills and felting-mills. There are the various sub-classifications of spinning, weaving, dyeing, and finishing mills, although, as a rule, all these separate processes of the manufacture of wool continue to be carried on jointly in this country, as the related parts of the one operation of manufacturing. In this statement is embodied the chief point of difference existing to-day between the woolen-mills of America, in fact, between all our textile mills and those of England and the Continent. The reasons for it lie on the surface of things. The fact remains that American textile mills can never expect — the great body of them, at least,— to compete successfully with foreign mills on terms which are fairly equal apart from the difference in wages, until they have passed through the same evolution and approximated to the same methods which prevail abroad.

Specialization.— In the wool manufacture, as in the cotton and silk manufacture, we have many establishments which, in completeness of structure, in perfection of machinery, in all the details of mechanical equipment, and in sagacity of management, are nowhere in the world surpassed. Indeed, it is only in this country that we find, on a very large scale, textile mills in which are performed all the separate processes for the manufacture of great varieties of goods. Elsewhere they have learned that the greatest economy and the best practical results are secured by specializing the processes. Thus in Bradford, England, are enormous establishments which do nothing but comb wool into tops, either on commission or for sale. Other great mills do nothing but spin tops into yarn, and generally they confine their operations to a limited variety of yarns. Still others, buying their yarn, devote themselves exclusively to weaving. And, finally, a fourth class of establishments take the woven goods and dye and finish them for the merchants, who are the men who find the ultimate market for all the specialists who have been thus employed upon the goods. In this specialization of the different branches of the work exists the characteristic distinction between the American and the foreign textile mills of to-day. Investigation appears to show that the English method is far superior to the American, and that ultimately we must gravitate into the former, if we are to cut any figure in competition for the world's market. The manufacturer who devotes his whole energies to one particular thing, and studies to do that one thing as cheaply and as well as it can be done, can do it better and more cheaply than the manufacturer who is doing half a dozen different things at the same time. This is not a theoretical deduction, but an axiom founded upon prolonged experiment and experience. Bradford manufacturers who have tried both methods say there is always a gain in economy when the weaver buys his yarns, instead of spinning them himself. Obviously the English method requires a smaller investment in plant, secures a simpler and more perfect autonomy in operation, involves less waste, and avoids the accumulation of superfluous raw material. The American woolen mill was evolved from conditions which rendered specialization originally impossible. It was situated in some isolated spot, drawn thither by a superior water-power, with no railroad to facilitate quick transportation, and was necessarily a complete mechanical entity, however crude its machinery. In a word, it must perform under one roof all the processes necessary to convert the greasy wool into the finished cloth ready for the market. Thus there sprang up all over the country little woolen mills, each one independent in itself; as the country grew some of these little mills became large mills; other large mills grew up beside them; gradually grew centres in which the wool manufacture predominated; but conditions were long in appearing which tended to that specialization of processes which has marked the English method from the very introduction of automatic machinery. It followed that the American mill owner, even of a small mill, was compelled to make a variety of goods, in order to use up advantageously all the grades of material which grew out of the sorting of his wool. Naturally he could not produce a variety of products as cheaply and as successfully as he could have manufactured one particular line upon which his whole attention was centred. These habits of manufacturing, forced upon us originally by the logic of the situation, are tenacious. We have been slowly breaking away from them, but it will be years yet before it is possible fully to outgrow them. In Philadelphia, which is the largest centre of wool manufacture, the progress of the evolution is very perceptible. There they have top-makers, yarn-makers, dyers, and finishers, who do nothing else. And the result is apparent in the large number of small manufacturers in that city. The small amount of capital required to equip a little weave-shed permits enterprising superintendents and operatives to start in business for themselves. The comparative cheapness of production under such conditions enables them to hold their own against the big establishments with unlimited capital at their back.

American Woolen Specialties.— The bulk of the small wool manufacturing establishments in the United States are woolen mills proper, as distinguished from worsted mills. It is noticeable that the number and product of these woolen mills decrease from census to census as the worsted manufacture gets more firmly established here, and the more popular worsted fabric comes into wider use. But there are certain lines of woolen goods in the manufacture of which American mills have earned a worldwide pre-eminence. Prominent among them are flannels and blankets of every grade and variety. The American wools are peculiarly suited for these goods, and for many years past our Amer-

ican mills have practically supplied the home market. Other mills make a specialty of woolen dress goods for ladies' wear with equal success. The bulk of our woolen mills are, however, engaged upon the manufacture of cloths for the million — cassimeres, beavers, satinets, cheviots, etc., the cheaper grades which enter into the consumption of the wholesale clothing houses, goods in which, under the weight duties of recent tariffs, our American manufacturers have controlled the home market, and of which their production has been enormous. Many of these goods are woven upon a cotton warp, and into some of them enters more or less of the revamped wool known as "shoddy." We have much to learn, however, in the handling of this class of materials, before we shall equal the expertness of foreign manufacturers. It is to the success of our manufacturers in producing a handsome, durable cloth at cheap prices, that our people chiefly owe their reputation of being the best-dressed people on the globe.

Worsteds.— The worsted manufacture was late in getting lodgment in the United States, and has been slow in assuming proportions commensurate with its importance abroad. Early in the forties there were two or three large worsted mills erected in New England for the production of worsted fabrics or stuff goods for women's wear; but the manufacturer made little headway until after the close of the Civil War, and it was not until about 1870 that we began making men's wear worsted goods. Since then the development of the manufacture along both lines has been phenomenal. In the manufacture of fine men's wear goods, both in woolens and worsteds, a few of our mills have been equally successful; their products sell side by side with the best makes of foreign goods, notwithstanding the lingering prejudice among fashionable Americans that only foreign-made cloths are fit to wear. Another obstacle is the high cost of labor, which counts more strongly in fine wool goods than in the cheaper grades, or in cottons and silks, because of the much greater care and skill and labor that must be bestowed upon their finishing.

Felted Wool.— The manufacture of felted wool is comparatively small here and elsewhere and the importations are comparatively insignificant in volume. Felted wool was the earliest form into which this fibre was manufactured, the primitive races discovering, before they learned to spin and weave, that peculiar characteristic of wool which causes it to mat together, by the application of heat, moisture, and pressure, into a firm and smooth texture, susceptible of a great variety of uses. Modern machinery has utilized this peculiarity for many purposes which, while limited, are economically important. Tablecloths and floor-coverings, and hats for men's and women's wear, are the most ordinary; but they are also used for shoe linings, sheathing materials, polishing purposes, etc. The hat manufacture, formerly confined to wool for its raw material, has found that fur is better suited for this use; and the processes of manufacture are so different from those employed in spinning and weaving mills that the hat-manufacturing establishments, in which the United States has always been pre-eminent, are not ordinarily classed among the textile mills.

Carpets.— Perhaps our most notable achievement in the textile line has been in the carpet manufacture. Beyond question the United States is the greatest carpet-manufacturing nation in the world; if we leave out of account the hand-loom productions of the Eastern countries we excel all others not only in the quantity of our production, but in the variety of our carpets, in the excellence of design and workmanship, and in general adaptability to popular needs. The production includes two-ply and three-ply ingrains, Brussels, moquettes, tapestries, velvets, Smyrnas, and the higher grades of Axminsters and Aubussons. The annual consumption of this product by the American people is close upon 100,000,000 square yards. The popular reason assigned for this unique development is the general prosperity of our people, the high wages earned permitting families of all grades of life to indulge in the luxury of floor-coverings to an extent elsewhere unknown. Stimulated by the lucrative market thus offered, American manufacturers have made larger and more important contributions to the mechanism of the carpet manufacture than those of all other nations combined. The real development of the machine industry dates from the successful application of power to the weaving of ingrain carpets by the late Erastus B. Bigelow in 1844. Subsequently he invented Jacquard looms for weaving Brussels and Wiltons, which produced carpets pronounced by the jury at the London Exposition of 1851 to be "better and more perfectly woven than any hand-loom carpets that have ever come under the notice of the jury." A still later invention of Bigelow's was for weaving tapestry carpets. His inventions are at the base of all the power-loom carpet-weaving now done in Europe. Subsequent inventors have greatly improved them, and have added new inventions, such as those for weaving Axminsters, and Smyrna rugs. By their skill and enterprise the American carpet manufacturers have not only retained the control of their own market, except in the matter of the Eastern hand-made rugs, but they have in some instances successfully forced their products upon the European markets.

Hosiery and Knit Goods.— In one other branch of the textile industry progress in the United States has outstripped the world — the hosiery and knit-goods manufacture. More machine-made knitted goods are turned out annually here than in all other countries combined. The explanation is somewhat the same as in the case of carpets. Our people wear more underwear than other people; they are not only obliged to wear more for climatic reasons, but they can afford to wear more; and the general desire for personal comfort in wearing apparel results in an enormous distribution of the products of these mills. The beginnings of the industry are well within the lifetime of many manufacturers still living. Until 1832 the knitting of socks and stockings remained mostly a household industry — the only form of textile work which the machine had not wrested from the housewife. In that year Egbert Egberts successfully applied the principle of knitting by power, at Cohoes, N. Y. His machine was simply the square stocking-frame of William Lee adapted to power. From that adaptation dates a revolution in underwear, which had previously consisted wholly of flannel, fashioned and

sewed at home, according to the individual needs. The revolution gathered momentum gradually, as invention after invention — almost all of American origin — perfected the knitting-machine; but once the new industry was fairly and firmly established, it spread with amazing rapidity. The great variety of goods made facilitates the tendency, peculiar to this industry, toward the building of comparatively small mills, requiring but moderate capital; and it happens in consequence that these mills spring up all over the country, and can now be found in nearly every State. Many of them employ only cotton as a raw material; others use chiefly wool; and still others manufacture what are known as merino knit goods or mixed goods — cotton mixed with wool in proportions varying from 50 to 75 and 90 per cent of cotton, according to the particular market sought. The tendency to the larger use of cotton in these goods is perceptible, not necessarily because of greater cheapness or a desire to adulterate, but because the liability of wool to shrink, and its excessive warmth, lead many to prefer undergarments in which cotton is an equal or predominating material. In 1858 E. E. Kilbourne invented a machine for automatically knitting full-fashioned underwear: and this machine has gradually wrought a second revolution in the industry. The amount of hand labor now done is reduced to the minimum — to the mere sewing on of buttons, so to speak.

Statistics.— The value of all textile products in the United States for 1850 was $128,769,971 and this had increased to $931,494,566 in 1900. The census report for 1900 shows the following:

Industries	Year	Number of establishments	Capital	Wage-earners		Cost of materials used	Value of products
				Average number	Total wages		
Cotton manufacture:							
Cotton goods	1900	973	$460,842,772	297,929	$85,126,310	$173,441,390	$332,806,156
Cotton small wares.	1900	82	6,397,385	4,932	1,563,442	3,110,137	6,394,164
Wool manufacture ...	1900	1,414	310,179,749	159,108	57,933,817	181,159,127	296,990,484
Silk manufacture	1900	483	81,082,201	65,416	20,982,194	62,406,665	107,256,258
Hosiery and knit goods	1900	921	81,860,604	83,387	24,358,627	51,071,859	95,482,566
Flax, hemp, and jute.	1900	141	41,991,762	20,903	6,331,741	32,197,885	47,601,607
Dyeing and finishing textiles	1900	298	60,643,104	29,776	12,726,316	17,958,137	44,963,331
Combined textiles	1900	4,312	$1,042,997,577	661,451	$209,022,447	$521,345,200	$931,494,566

The number of cotton spindles in operation in 1900 was 19,008,352, as compared with 14,188,103 in 1890, and 10,653,435 in 1880. This striking increase is due in a large measure to the wonderful growth of the industry in the South since 1880, as before that date the cotton manufacturing industry existed there only on a most restricted scale. In fact, the growth of the industry in the South may be regarded as the one great fact in its history during the past decade. It has been fairly continuous and remarkably steady.

In a single branch of textile manufacturing — flax — our efforts have not been as successful as could be desired. The industry has expanded greatly, however, since 1890, as is evidenced by the fact that for the last census there were reported 18 establishments, with a capital of $5,688,999 and products valued at $4,368,159, as compared with 5 establishments showing a capital of $2,734,130, and products valued at $2,880,341 in 1890. These products were chiefly thread and twine, the latter for use in the shoe manufacture, although the manufacture of linen toweling shows the greatest expansion of any branch of linen manufacture during the decade from 1890 to 1900.

Future Needs.— The American textile manufacturers have left little to be desired in the direction of cheapening textile products without deteriorating quality. They have built and equipped mills which rank with any in the world. They have planted on this continent machinery enough to supply all the textile wants of our people, except in a comparatively few lines of very fine fabrics. They have managed these mills with rare business sagacity, and as a rule with notable financial success. They have taken one specialty after another which had never been attempted here, and transported its manufacture from across the water, literally inventing anew the necessary machinery, as in the case of braids and plush goods, when they could not obtain it otherwise. They have taken these several textile industries, which have been localized and specialized in Europe for generations, and in half a century have made them one of the chief corner-stones of our national wealth. They have contributed far more than their share to the mechanical development which makes the labor of a single operative stand for that of a regiment of hand-workers in the 18th century. They have fallen short only in contributing to the artistic side of textile industry. They have been imitators instead of originators, although there are among them many striking and gratifying exceptions to this rule. But American-made goods do not bear, generally speaking, any distinctive artistic characteristics which distinguish them as American-made; and, generally speaking, they are inferior in this respect to the best products of foreign looms. All this is natural — natural to a new country in which utility everywhere predominates over the ornamental. The next great forward step in our textile manufactures must be in the artistic rather than the mechanical direction, for there we recognize its weakest point. In the designing of patterns, in the use and application of dyes, in all that goes to impart to fabrics the artistic element, to lift the manufacture into an art, our textile mills are still far from the top of the ladder. This deficiency is not in any sense peculiar to the textile industries. It is an educational deficiency in which our people as a whole may be said to share. It is incidental to a crude country of limited facilities in art directions. What needs to be done is to supply those facilities; and the

time is at hand when our manufacturers should themselves take the initiative in that work. There should exist in this country as in Europe technical schools for the training of textile workers — weaving schools, designing schools, dyeing schools — in which those who manufacture goods are trained by the best instructors; and the result will be not only better workmanship, but more beautiful and more artistic tissues.

S. N. D. North,
Director of U. S. Census, Washington, D. C.

Textiles or Textile Fabrics. Stuffs made by the weaving together of threads of any sort, so as to produce a material with a nearly solid surface. A fishing-net or the like is not a textile fabric because the cords which compose it are not woven together, but cross one another at equally distant intervals and are strongly knotted at those points. But mosquito-netting is a textile, although very open, because the threads are merely held by their own friction. On the other hand, if a basket is made by weaving together strips of wood or bamboo, such a material is hardly called a textile, but this merely because of its totally different usage. The cane seat of a chair is as truly woven as a piece of muslin or silk.

Textiles in the usual sense are made of the twisted fibres spun into thread of flax or linen, cotton, hemp, jute, silk or wool. The simplest weaving is that which produces our common cotton and linen cloth; that is to say, the threads are merely woven together, one up and one down, and all in the same manner, except that at the edge on either side of the piece what is called a selvage is produced to prevent the raveling out of the threads. From this to the most complicated fabric like brocade the differences are almost infinite, and it is only with the most elaborate diagrams and the fullest explanations that the process of weaving a figured *broché* silk or a velvet with patterns of pile upon pile can be explained. Carpet weaving (see Carpet) differs somewhat from ordinary textiles, and tapestry (q.v.) differs yet more, and is often excluded from textile fabrics altogether.

The general nature of a loom is that the threads of the warp are divided into two sets, one of which is thrown upward, while the other is thrown down, and at the same moment a shuttle carrying a thread of the woof is driven through between the two sets of warp threads. The next movement of the loom reverses the two sets of warp threads, throwing the upper one down and the lower one up, compressing and drawing tight the woof thread into the loops which show on the surface of the stuff and go to form the surface, and the shuttle is driven through again in the opposite direction. The constant repetition of this forward and backward movement of the shuttle gives a strip of woven fabric which continually grows broader: and as each movement of the shuttle is made, an appliance drives the last thread of the woof back against the others, so that this growing strip of woven stuff is kept at a uniform state of firmness and solidity. It is in this way that the simplest fabrics of linens and cottons are made. If it be desired to produce a somewhat more elaborate weave, such as a twilled material, this is done by raising two threads of the warp and dropping one; or by raising three threads of the warp and dropping one, and so on. In this way, as is evident, the threads of the woof are seen lying in loops or what seem to be stitches longer than those of the simplest weave, and these longer loops arrange themselves in a steplike diagonal across the woof of the stuff. It is clear that, by the increasing complication of such alternate liftings and lowerings of the warp threads, more patterns may be made. If, then, the threads of the woof are of a different color from those of the warp, there is produced a surface whose general color is half way between the two colors of warp and woof. If we take a step further in complexity and use three or four warp threads say, of red, while the rest remain white, and do the same thing with the woof threads, we produce stripes three or four threads wide; and where these stripes cross one another there will be a little square of the solid color of the three or four threads, while the stripes elsewhere remain of the half-way tint alluded to. Again if three threads of different colors are passed by the shuttle at one time the threads of the warp also being grouped in threes there will result a simple alternating pattern, which is often very attractive. Indeed, much of the primitive designing of early races is based upon such very simple productions of the loom; for it seems that the mind of man is never tired of a pattern produced by up and down, in and out, in their different combinations. In the most complicated pattern of a brocade, such as the Japanese send us occasionally, in which a row of dragons will alternate with a row of representations of "the sacred pearl" with its flames, and those again with a row of kylins or other fabulous monsters, all being interspersed with elaborate leafage, open flowers of the camellia and bursting fruits of the pomegranate, the same being reproduced in many colors — even in such a complex pattern it is readily seen that these figures are arranged in regular sequence, and that the colors are introduced in a definite and unalterable succession. Thus a blue thread of the woof may not appear more than once in each flower, of a certain row across a piece of stuff, and this appearance of the blue thread may be for a loop of a quarter of an inch long only, while all the rest of that blue thread is found to be hanging loose behind the finished fabric. Again this blue thread may not appear at all in six or seven inches of the length of the stuff, and then it may supply a wholly different detail of the pattern. Still that blue loop in the design as seen from the front or "right side" is found in each one of the flowers or animals which form the cross row of the pattern; and in the next row of similar flowers or animals (which may be two feet away in the length of the piece) this blue thread may be replaced by a crimson one, which will also appear at exactly the same intervals and at exactly the same point in each one of the flowers, or of a unit of design. It is interesting to take a piece of very rich fabric with an elaborate pattern and to examine it with a view to just such peculiarities of weave. Anyone who has watched a simple loom at work and has mastered the process may then understand in great measure the workings of the far more elaborate loom of the silk weaver, who is producing patterned fabrics.

In such weaving of patterns it is here assumed that the threads are dyed before the

weaving is begun. The matter of printing colors upon calico, thin silk or the like, is entirely apart from the consideration of textile fabric. Printing is done from blocks with color, almost exactly as if the material receiving the pattern were paper instead of a woven stuff.

The simplest weave made in this way with colored threads is gingham; the name of which comes from the East, probably from India, with the invention of the weave itself. Checks, plaids and stripes are the natural patterns of gingham, but it is also practicable to produce various zig-zags and frets, and the stripes themselves may be variegated by patterns on their surface. Weaves of Persian and Chinese origin with threads softer and more woolly than European twisted cotton threads, are sometimes very attractive in color effect, woven exactly as gingham is woven.

Damask linen, such as is used for tablecloths and napkins, is peculiar in that the pattern is an elaborate twilled fabric in which the twill is arranged to make a pattern — often even of flowers and leaves. These patterns are seen merely by the difference of reflection of light upon the threads of the linen; for those threads which lie parallel in one direction seem brilliant from a given point of view, while those lying in the other direction look dusky. A change of the position of the beholder reverses this effect of light and dark. Moreover it is common that the same pattern is seen in reverse on the other side of the fabric. There is nothing to prevent damask linen being woven with dyed threads in parts of the composition, and occasionally tablecloths of such material come into fashion.

Brocade, a term generally used for very splendid material means primarily a stuff — composed in part of threads which lie on the surface of the finished stuff (French *brochés*), appearing where the particular color is needed and disappearing again as explained in the paragraph above. A brocade may be composed of threads all of one color. Thus the silks called *damassé* (French *Damassés*, or *Damassées*) have perhaps a pattern of dark green leaves relieved in shining threads upon a background of exactly the same dye, but looking different because of the different and less glistening character of the threads; this being caused not by the silk being differently spun, but because of the different treatment of the thread in the loom, the long loops lying flat and loosely, and reflecting the light in a different way from the hard pulled threads of the background.

Satin is a material with a silken surface of unusual and uniform glossiness, which is produced by alternately "raising and depressing four yarns of the warp across the whole of which the weft is thrown by the shuttle." It will be noted that this is a modification of twilling, and the threads of satin are seen to lie in the same way as those of a twilled cotton. It is evident that such a surface is capable of many modifications. Thus there are some fabrics of silk and wool, or silk and cotton, in which the silk threads are thrown to the surface, lying in very narrow stripes or bands, which show glossy on the background, which also show only in very narrow stripes between the others. These fabrics take different names from year to year.

Again, there are Eastern brocades in which the background is composed entirely of the warp threads in a satin weave of one color; while the flowers of the pattern are made up entirely of the woof threads and these in many colors with gold.

There remains to be mentioned those weaves in which the warp threads only are seen in the finished stuff. The most common form of this is ordinary ribbed silk, in which the warp threads form loops (silks called gros-grain and by other special names), giving a rib running across the stuff. Thus a silk in longitudinal stripes of darker and lighter green, buff and brown, has all its woof threads of a dull brown; while the warp threads of the four colors named form visible ribs in which the colors are alternated in a very elaborate fashion, so that one stripe is made up of a small check in two colors, another is plain and solid, of one color; and in all this the only effect of the dark woof is to modify slightly the hues of the stripes by showing between the warp threads.

Velvet is made by carrying the threads of the warp over a rod called a needle, so as to produce a series of ridges or "ribs," much as in the last paragraph; and then cutting all these ridges by a sharp instrument passed in as the "needle" is withdrawn. This cutting leaves the threads standing up to form the nap or pile, but they are left of different lengths or heights, and therefore the whole surface is most carefully sheared and sometimes this shearing is helped by singeing. Fustian, velveteen and corduroy are made by the same process. Plush is a material of the same character, and produced in nearly the same way. When the ribbed surface is left without being cut, the term "uncut velvet" is used. This may be used for a part of the surface, while other parts are fully cut and brought to the smooth surface common to velvet. In this way most elaborate patterns are produced — figures being in the velvet pile upon the ground of uncut velvet. Again this may be carried further in producing what is called "pile upon pile" velvet, in which the pile of one part of the pattern is relieved upon the shorter pile of another part of the pattern and this again upon the uncut background. It is evident that such stuffs are of great cost. The beauty of the pattern may also be enhanced by the use of different colors. Thus the velvets of Genoa and of Venice of the 17th century and modern copies of the same may have a general surface or background of a satin-like texture, upon which the flowers and leaves of the pattern are raised in uncut velvet in ridges made of projecting loops, and upon this again is relieved a pattern of cut velvet, smooth and uniform in surface; both these surfaces, the uncut and the cut velvet, being woven with three, four or five colors, the threads being dyed beforehand in dark and light green, crimson, buff and the like. The resulting pattern will be of extraordinary richness, effective at a distance and also near at hand. Such pieces made in Venice at the close of the 19th century would cost about 60 francs a yard when woven 20 inches wide.

The further elaboration of decorative weaving by the introduction of other materials than those of twisted threads, is also of importance. Thus "gold thread," as it is called, is commonly made of silver wire gilded and then pulled out, or

"drawn," the silver and gold together, until it is very fine. This is apt to tarnish, the extremely thin gold disappearing with wear, and the silver not having the power of resisting impurities in the air. To avoid this, where a permanently metallic effect is desired, gold paper is used by the Orientals, the paper being sometimes brown, as it shows on the reverse side of the stuff, and the gilded surface showing on the right side. The less expensive Japanese brocaded silks are often woven in this way. On the other hand, the tarnishing of the metallic gold thread often adds a special charm to the effect of ancient stuffs.

As textile fabrics have been used by all men more advanced than the most degraded savages, the history of textiles is of infinite extent. Even textiles of decorative purpose, those woven in a somewhat complicated way, are of unknown antiquity. Decorative stuffs have been found in Egyptian tombs of very early epochs. The tombs of the lost races of South America have been found to contain beautiful weaves. The earliest painted vases found in Egypt show boats with sails, and although some of these sails were perhaps of skin, there are others in which the evident purpose has been to show a woven material. Western Asia has always been the home of the most beautiful designs in weaving, for at a very early time the people of the great plain through which the Tigris and the Euphrates run were producing fabrics with the most varied and splendid patterns. This tendency to use the Asiatic feeling for color decoration in work with the loom took two different forms in later times. The carpets and rugs woven with pile were brought from Syria into Europe at least as early as the 8th century A.D., and at a later time they were somewhat common in Europe, as is clear from the earlier Italian paintings, in which rugs of unmistakably Eastern design are seen to cover the foot-stool or the throne of a sacred personage. Other heavy stuffs used in the West for floor cloths and also for door and window curtains under the general name of kelim, are woven without pile, the patterns being therefore much simpler, akin to those described above in connection with gingham and especially with twilled materials. Brocades of different kinds, and also solidly woven, very durable silk stuffs made with threads dyed of different colors, but woven in such minute patterns that the thread nowhere shows as *broché* on the surface, have been made for so many hundred years that the time of their introduction is hardly ascertained. Cotton stuffs woven in a similar fashion with very pretty effects of simple patterns are but little imported to Europe, but their use in the East adds a great charm to the popular costume. Finally the printing of cotton cloths with wood blocks has been practised for centuries, the pattern being admirably drawn and composed and the colors always interesting except where the effect of European commerce has been, first, to substitute the cheaper chemical dyes of Europe for the more permanent and more beautiful dyes of the East, and, secondly, to debase the color design through the orders given by the agents of Western importing houses. The growth of a beautiful textile industry in Europe and the United States is made difficult by the rapid changes of fashion which themselves are brought about by the great desire of large manufacturers to produce the material and the effect which will attract buyers. This tendency is aggravated by the unwillingness of the great dealers to keep in stock fabrics which are out of fashion, because they are very numerous, because a considerable stock of any one would be a troublesome thing to house and to show on occasion, and because "it costs too much to sell" goods that are not in constant demand. Everyone knows how often the material which at a certain time he found to be exactly what he needed cannot possibly be obtained a few years later.

The greater number of the books devoted to this subject are collections of plates, often in color, and beautifully printed. These, however, give merely the design, while the nature of the stuff can only be guessed. It is rare that any discussion of the fabric or of the manufacture accompanies the plates. The best of these books is Fischbach's 'Ornamente der Gewebe.' The works on Costume (q.v.) often contain much of the same material. For eastern carpets, Lessing's 'Alt Orientalische Teppichmuster' (Berlin 1877) gives a number of fine designs collected from paintings of the Renaissance. Vincent Robinson's 'Eastern Carpets' (London 1882), and the second series of the same (London 1883), present a number of admirable specimens belonging to the owner, who is a dealer on a large scale and also a collector on his own account. The colored prints are from excellent original drawings. Several books on Eastern rugs have been published during the last few years, of which we name Mumford's 'Oriental Rugs' (New York 1900). There is a magnificent work, which gives the Oriental carpets in the Austrian imperial collection. The beautiful stuffs known to have been used during the Middle Ages are treated by Francisque-Michel in 'Recherches sur Le Commerce,' etc., 'Des Etoffes de Soie,' etc. (2 vols. Paris 1852), and by Dr. Daniel Rock, in 'Textile Fabrics,' the South Kensington illustrated catalogue (London 1870). The same author has supplied the 'South Kensington Handbook' (London 1876). Fr. Bock's 'Geschichte der Liturgischen Gewänder des Mittelalters' (Bonn 1859–71) is the standard work on the subject of church ceremonial garments, constantly cited by all writers. One of the most valuable works for the student of the technical side of textiles is 'The Draper's Dictionary,' by William S. Beck (London n.d.), and the modern fabrics in common use are intelligently treated by Caulfield and Saward in the 'Dictionary of Needlework' (London 1885), and also by Lady M. Alford in 'Needlework as an Art' (London 1886). See Weaving.

Russell Sturgis.

Textual Criticism, the science by which the texts of ancient writings are examined so as to decide upon their authenticity, their completeness, and the degree of exactitude with which they represent the original words of the assumed author. This is sometimes called the Lower Criticism as distinct from the Higher Criticism; the former is destructive, or at least negative, in its results. The principal aim of the Lower Critic is to reject what he considers corrupt or spurious. The Higher Critic is constructive and builds up a theory regarding the nature, object, origin and authorship of a liter-

ary monument founded upon the material furnished by the Lower or Textual Critic. Thus the latter deals only with letters, and the substances on which they are written, and relies upon palæography (q.v.) for his data. He deals with words, their derivation and use, and draws upon philology (q.v.) for guidance; he studies the syntactical construction of sentences according to the usage of various ages, and is guided by the science of grammar (q.v.). He also calls to his aid the resources of archæology in determining the date of literary documents.

While Textual Criticism has been employed for many years on the classical writers of Greece and Rome — and for a signal example of its application we may cite the Homeric theory of Friedrich August Wolf (q.v.) — we shall confine ourselves in the narrow space available here to the canons which regulate its application, with a summary of its history as relating to the text of the Hebrew and Greek Scriptures.

Principles of Textuol Criticism.— In examining a number of manuscripts which may have different versions of the same passage, some variations will be rejected as absurd; they are clerical errors; or the result of carelessness, lapse of attention, or tricks of memory. No one can suppose them to be genuine. Among readings any one of which might possibly be the genuine and original text, choice has to be made in accordance with the theory of probabilities. The critic must consider what decision will best explain the phenomena before him in accordance with the canons: "that reading is to be accepted as genuine which best explains the origin of the other variants." This is a cardinal principle of textual criticism. It demands a consideration of the number and importance of the witnesses supporting a reading; but although one early manuscript may outweigh the evidence of many later ones, mere antiquity cannot of itself establish the authenticity of a reading. As affording illustrations of the application of the above canon we may cite the rule of the great Bengel: "The more difficult reading is to be preferred." This is especially pertinent in view of intentional change or corruption of the text, for no forger would insert a strange or novel word or construction, such as would excite suspicion, but would keep as closely as possible to the character and diction of the context. Again, what Porson called the "surest canon of textual criticism" is "The shorter reading is always to be preferred." Transcribers of manuscripts would be unwilling that their work should be considered incomplete; hence they would be far more likely to expand than to curtail. On the other hand, as it was usual to insert explanations, comments, and glosses either in the margin or between the lines of a manuscript, these were likely to slip into the text and to be taken for part of the original by ignorant, careless, or inexperienced scribes. Even the careful and conscientious scribe might mistake such marginal notes for words omitted by accident, and added, as they often were, interlinearly or alongside the text. But when two clauses have like endings the omission of one of them in a manuscript may be explained by *homœoteleuton* (their confusing similarity of ending), and the clause left out should always be restored. Above all the critic must carefully study the principal texts, their connection with each other, and the transmission of particular points, strong or weak. The ancient versions, the patristic citations must be investigated as a part of this study from which the most brilliant results have been obtained, both in Hebrew and Greek criticism. Textual criticism sometimes allows recourse to conjectural amendment. A word may be changed because to the critic's mind the reading before him does not admit of a sane or harmonious interpretation. Felicitous conjecture has restored many of the finest writings of antiquity to what was probably their original clearness and completeness. One of the happiest of these emendations was that of Lachmann in his edition of 'Lucretius,' where he hit upon the brilliant reading of *decellit,* a word found nowhere else in Latin literature. Conjectural emendation is, however, a very dangerous weapon, and there is no more dismal proof of this than is exhibited in Bentley's edition of 'Horace.' Bentley, indeed, had a craze for this branch of criticism, and actually undertook to change the language of Milton's 'Paradise Lost,' on the ground that the poet could not have used such and such expressions, and must have written what to the critic's mind was more consonant with the poetic style of his age. The conjectural critics have also busied themselves a good deal with the Hebrew and Greek Scriptures, but the Lower Critics have not been so reckless in their work of destruction as the professors of the Higher Criticism, who have not shrunk from building airy edifices about the authorship and authority of these ancient books which sometimes seem to be as fanciful as they are contradictory one to another.

The Hebrew Scriptures.— The text of the Old Testament does not afford so much ground for verbal criticism as that of the New Testament. In primitive Hebrew there were no vowels; only the consonants were written, and the syllabification left to be implied from the spoken tongue. The vowel points were, however, added by the Jewish doctors of the 6th century A.D., in what is styled the Massoretics or traditional version. Great anxiety for the integrity of the Hebrew text always characterized the learned Jews, but we have no manuscripts of the Old Testament of earlier date than the 9th century A.D., and this makes the improvement of the text a difficult matter; there is no such large range of manuscripts of the Hebrew as we possess in the Greek Scriptures, and the chief basis of comparison in effecting an emendation is to be found in the Targums (q.v.) and various versions of the books.

New Testament Criticism.— The materials for textual criticism of the New Testament are ample and voluminous, and are generally enumerated under the heads of copies, versions, and patristic citations. Copies are found on papyrus, vellum, and paper, written either in uncial or large letters, or cursive, that is, running hand. Only fragments of the New Testament are found inscribed on papyrus. The most important vellum manuscripts belong to the 4th, 5th and 6th centuries A.D. Of the versions, the most important are the Syriac, Latin, and Egyptian, and a comparison of these with extant Greek manuscripts has been of great advantage in clearing up many passages of doubtful meaning or authority.

WILLIAM MAKEPEACE THACKERAY.

Tezcuco, tās-koo'kō, or **Texcoco**, Mexico, a town in the state of Mexico, situated on the northeast shore of Tezcuco Lake, 16 miles northeast of the national capital. The modern town has many handsome buildings, a number of manufacturing establishments, and railroad repair shops. Tezcuco was one of the three confederated Aztec pueblos of the valley of Mexico, and for a time was the chief among them, yielding later the first place to Tenochtitlan. In its neighborhood are several ancient ruins, including remains of teocallis. Pop. with commune about 16,000.

Teziutlan, tā-sē-oot-län', Mexico, the capital of a district of the same name in Puebla state, 12 miles east of Zacapoaxtla. Pop. of town 8,200; of district 25,300.

Thacher, thăch'ẽr, **John Boyd**, American writer: b. Ballston, Saratoga County, N. Y., 11 Sept. 1847. He was graduated from Williams College in 1869, and was a New York State senator 1884–5, and mayor of Albany, N. Y., 1886, 1887, 1896, 1897. He was an officer of the World's Columbian Exposition and became chief of its bureau of awards. His publications include 'The Continent of America, Its Discovery and Its Baptism' (1896); 'Charlecote — Or the Trial of William Shakespeare' (1896); 'Little Speeches'; 'Awards,' etc.

Thackeray, thăk'ẽ-rĭ, **William Makepeace**, English novelist and humorist: b. Calcutta, India, 18 July 1811; d. 23 Dec. 1863. He was placed at the Charterhouse School, London, and afterward studied at Trinity College, Cambridge. He left the university without taking a degree; and having inherited from his father some £20,000, he found himself at liberty to follow the bent of his inclination, which pointed toward art and literature. After living some time in London he traveled in France and Germany, and was introduced to Goethe at Weimar. He entered the Middle Temple to study for the bar in 1831, but he soon gave up this profession (though called as a barrister in 1848), and in 1834 he settled at Paris to study art. He gradually became convinced, however, that art was not his vocation; and his fortune being much diminished — if not altogether dissipated — by losses and unlucky speculations, he resolutely set himself to fight his way in the profession of literature. He was at one time the Paris correspondent of the radical *Constitutional* (while holding this post he married, in 1836), and later (1837–8) he was connected with the *Times*. Under the names of "George FitzBoodle, Esq.," or of "Michael Angelo Titmarsh," he contributed to 'Fraser's Magazine' tales, criticisms, verses, etc., which were marked by great knowledge of the world, keen irony, or playful humor. It was in this magazine that 'The Great Hoggarty Diamond' appeared, a story, like all Thackeray's, of a genuinely manly tone, and containing kindly satire and unaffected pathos; and also 'Barry Lyndon,' in which the adventures of an Irish sharper and adventurer are detailed with great force and humor. In 1840 he published separately the 'Paris Sketch-book,' in 1841 the 'Second Funeral of Napoleon' and the 'Chronicle of the Drum,' and in 1843 the 'Irish Sketch-book' — the result of a tour in that island. None of these writings attained to any great popularity, though some sharp-eyed critics, among others John Sterling, had begun to prophesy the future eminence of their author. In 1841 'Punch' was started, and he contributed both by pen and pencil to that periodical, his 'Jeames's Diary' and the Snob papers ('Book of Snobs') being very successful. In 1847–8 his novel of 'Vanity Fair' was published in monthly parts, with illustrations by himself; and long before its completion its author was unanimously placed in the first rank of British novelists. His next large work was the 'History of Pendennis,' a novel containing a good many incidents from his own early life, completed in 1850. In 1851 he delivered a course of lectures in London on the 'English Humorists of the Eighteenth Century,' repeated in Scotland and America before large audiences, and published in 1853. His next novel was the 'History of Henry Esmond' (1852), which was followed by 'The Newcomes' (1855), perhaps the most pleasing, as 'Esmond' is the most finished, of all his fictions. His remaining novels are 'The Virginians' (1859), 'Lovel the Widower' (1860), and 'The Adventures of Philip' (1862). Another, 'Denis Duval,' was left unfinished at his death. In 1855–6 he delivered a series of lectures in the United States on 'The Four Georges,' repeated in England and Scotland. In 1857 he offered himself as representative of the city of Oxford in the House of Commons, and was defeated by a small majority. In 1859 he became editor of the 'Cornhill Magazine' (the first number of which bore the date of January 1860), but he did not hold this post very long, as it demanded too much time and attention, and was not very congenial. His last three novels, together with a series of gossiping articles called 'Round-about Papers,' came out in this magazine. Thackeray was one of the most kind-hearted, manly, and honorable of men, ever ready to assist a friend, but the unsparing enemy of falsehood, meanness, and hypocrisy. His style is pure, quiet, flowing, idiomatic English. Much of his humor is strongly tinged with irony, but his comic power is noteworthy. Besides the works mentioned he wrote 'Notes of a Journey from Cornhill to Grand Cairo,' 'Mrs. Perkins' Ball,' 'Our Street,' 'Dr. Birch and His Young Friends,' 'Rebecca and Rowena,' 'The Kickleburys on the Rhine,' etc. A library edition of his works came out in 1867–9, others being the Standard (1883–5) and the Biographical (1898–9), the latter edited by his daughter, Mrs. Richmond Ritchie (q.v.). Consult Merivale and Marzials' 'Life' (1879); Ritchie, 'Chapters from Some Memoirs' (1894); and the biography by Trollope (1879) in the 'English Men of Letters' series.

Thai, a word meaning "free," and the general designation of certain peoples of Farther India, including the Thos, Muongs, Shans, Laotians, and Siamese. Although widely diverging in certain characteristics, they speak languages derived from the same stock, and are evidently of common descent. The Siamese, the best known and most civilized of the Thai group, are considerably mixed with Malays, Hindus and other races, and are of medium stature and broad-headed. The Laotians are shorter in stature than the Siamese, and their skulls are less distinctly of the broad-headed type. See Laos; Shan States; Siam.

Thais, thā'ĭs, a Greek hetæra: b. at Athens, who accompanied Alexander the Great on his expedition to Asia. She is said to have instigated Alexander to set fire to the citadel of Persepolis, the residence of the Persian kings, in revenge for the injuries done to her native city by Xerxes; but this anecdote, though immortalized by Dryden, is probably untrue, as we know on the authority of Arrian that it was his intention to sack the place and burn the citadel on grounds of state policy. After the death of Alexander, Thais became the mistress of Ptolemy Lagi, and, according to Athenæus, was afterward married to him. She was celebrated for wit and repartee, and many anecdotes are recorded of her talent in those respects.

Thalberg, täl'bĕrg, **Sigismund,** Swiss pianist: b. Geneva 7 Jan. 1812; d. Naples 27 April 1871. He was the natural son of Prince Moritz Dietrichstein and Baroness von Witzlar. He studied piano playing. At 14 was an accomplished player. In 1830 he made his first concert tour in Germany and in 1835–45 toured in Belgium, Holland, England, Russia and Spain, while in 1855–6 he visited South America and the United States. His playing was notable for its beauty of tone and the charm of its legato, rather than for brilliancy or fire. To him belong certain innovations in playing, accepted on account of his prominence though not original with him: such for instance as that of playing the cantilena in strongly accented notes by the thumbs, while the disengaged hand plays arpeggios or octave-passages above and below the melody. His operas 'Florinda' (1851) and 'Cristina di Suezia' (1855) were both failures. He composed many piano pieces, including fantasies on themes from various operas. His 'Studies' for the pianoforte are highly valued by teachers.

Thal'enite, a native yttrium silicate, having the formula $H_2Y_4Si_4O_{15}$, recently discovered in Österby, Sweden. It occurs in tabular, monoclinic crystals of a flesh-red color; hardness 6.5; specific gravity 4.23.

Thaler, tä'lĕr. See DOLLAR.

Thales, thā'lēz, Greek philosopher: b. Miletus, Asia Minor, about 624; d. about 543 B.C. He was the earliest philosopher of Greece, and founder of the Ionian school. He traveled in Crete, Phœnicia, and Egypt, where he calculated the heights of the pyramids, and received instructions from the priests. From them he probably acquired a knowledge of geometry, in which, however, his researches seem to have carried him beyond his teachers. After his return he was reckoned among the seven wise men, and his sayings such as Γνῶθι σεαυτόν ("know thyself") were in the highest repute among the ancients. To the Ionians he gave the wise counsel to form a general confederacy for the purpose of resisting the Persian power, and to make Teos the seat of the union. He also dissuaded the Milesians from entering into an alliance with Crœsus against Cyrus. His philosophical doctrines were preserved only by oral tradition, until Aristotle committed them to writing several hundred years after his death. He considered water the element of all things. His most important pupils were Anaximander, Anaximenes, and Pherecydes.

Thalia thā-lī'a "the blooming one," one of the nine Muses. She was the Muse of comedy and pastoral poetry, and is usually represented with the comic mask and the shepherd's crook in her hand. One of the Graces was also called Thalia. See GRACES.

Thal'lium, a metallic element discovered by Sir William Crookes (1861) in a deposit obtained from the lead chambers of a sulphuric acid works at Tilkerode in the Harz. On examining this deposit with the spectroscope the discoverer observed a single sharp and brilliant green line, which was afterward shown to be characteristic of this element. Crookes gave the element the name of thallium from the Greek *thallus,* a green twig. Thallium is found in many natural sulphides such as those of iron, copper, zinc, bismuth, etc. An important mineral containing it is Crookesite, a compound of sulphur, copper, silver and thallium. When iron or zinc sulphide is burned in the process of making sulphuric acid, the thallium burns to its oxide which collects in the flues or in the lead chambers. To obtain metallic thallium from this flue dust, it is dissolved in dilute sulphuric acid, filtered, and hydrochloric acid added. The slightly soluble thallium chloride separates. This is changed to the sulphate, purified of the various elements accompanying thallium, and the thallium sulphate decomposed by electrolysis or by action of zinc. Thallium, symbol Tl, has an atomic weight of 204, specific gravity 11.8 and fuses at 554° F. A freshly cut surface has a brilliant silver white lustre which is quickly lost by the oxidizing action of the air. It is softer than lead and is malleable. The metal dissolves readily in sulphuric or nitric acids, but only slightly in hydrochloric acid. It forms two classes of compounds: the thallous compounds derived from the oxide Tl_2O, and the thallic compounds from Tl_2O_3. The salts of the first class resemble the corresponding salts of potassium and sodium. The chloride, however, resembles those of silver and lead in its insolubility in water. Thallium compounds give a green color to a non-luminous flame. They are very poisonous, resembling lead in physiological action. Thallium and its compounds are used in the manufacture of thallium glass, the high refractive power of which makes it valuable in the preparation of optical instruments and of artificial gems.

Thalloph'yta. See BOTANY.

Thames, tĕmz, Canada, a river in the southwestern part of Ontario, rising in Perth County, and flowing southwest, 160 miles, into Lake Saint Clair. It is navigable, 18 miles to Chatham, by boats of considerable size, but has a difficult bar at the mouth. On the banks of this river, about 30 miles above Chatham, a final stand was made by Gen. Proctor and Tecumseh, when pursued by Gen. Harrison in the War of 1812. The position chosen was poor and very favorable to the American advance. On 5 Oct. 1813 Harrison with 3,000 men attacked and by a vigorous charge of cavalry under Col. Johnson drove the British in great confusion from the field. Tecumseh was slain and Gen. Proctor himself barely escaped capture. The Americans lost 45 and the British 48, besides 33 Indians; 477 prisoners were captured. The results of the battle were: the Indian Northwestern Confederacy was destroyed; the British power in Upper Canada was broken,

and practically all that had been lost by the Americans at Detroit was regained.

Thames, thāmz, Conn., a river in the southeastern part of the State, formed by the junction of the Quinebaug, Shetucket, and Yantic rivers at Norwich, whence it flows south about 14 miles to the Long Island Sound. Near its mouth on the right bank, lies the city of New London. It is really a tidal estuary, a wide and beautiful waterway navigable for large vessels to its head, and an important avenue of commerce.

Thames, tĕmz, England, the most important river in Great Britain, rising in Gloucestershire, and flowing in an irregular eastward course into the North Sea. It separates the counties of Gloucester, Oxford, Buckingham, Middlesex, and Essex on the north from Wilts, Berks, Surrey, and Kent on the south. Its total length, measured from the Nore Light, is 217 miles, of which 180 miles are navigable. The river passes the cities of Oxford, Reading, Maidenhead, Windsor, Chertsey, Kingston, and passes through the heart of London. Below London it widens gradually into an estuary, which, at the mouth, is 27 miles wide. The river is navigable for the largest vessels up to the east end of London, where the great Victoria, Albert, and West India docks have been constructed. The upper course is connected by an extensive canal system with the Severn River and the middle counties. The Medway is the largest tributary.

Thanatop'sis, a poem by William Cullen Bryant, published in the 'North American Review' in 1816. The title, from the Greek, signifies "a view of death." The poem, written when the author was but 19, is in blank verse, and is perhaps the most impressive of Bryant's productions.

Thane, the name of an ancient rank among the English or Anglo-Saxons. A freeman not noble was raised to the rank of a thane by acquiring a certain portion of land (five hides for a lesser thane), by making three voyages at sea, or by receiving holy orders. Offices, whether connected with the constant personal service of the king, or only during his residence in the thane's district, or with the administration of justice, were entrusted only to the thane, whose landed property was a guarantee for his conduct. The Anglo-Saxon thanes were the predecessors of the Norman barons.

Thanksgiv'ing Day, in the United States, an annual festival of thanksgiving for the mercies of the closing year. The day is fixed by proclamation of the President and the governors of States. The President's proclamation makes the day a legal holiday in the District of Columbia and in the Territories. In 1789 the Episcopal Church formally recognized the civil government's authority to appoint such a feast, and in 1888 the Roman Catholic Church also decided to honor a festival which had long been nearly universally observed — though nowhere with such zest as in the New England States, where it ranks as the great annual family festival, taking the place which in England is accorded to Christmas. The earliest harvest thanksgiving in America was kept by the Pilgrim Fathers at Plymouth in 1621, and 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 — as did President Madison in 1815. Washington appointed such a day in 1789 after the adoption of the Constitution, and in 1795 for the general benefits and welfare of the nation. Since 1863 the Presidents have always issued proclamations appointing the last Thursday in November as Thanksgiving Day.

Thap'sia, a genus of umbelliferous plants, either perennial or biennial. The decompound leaves are doubly or trebly pinnatifid, the flowers are small, yellow, white, and purple, in many-rayed compound umbels, without involucre, and often without the small-bracted involucels. The most important *Thapsia* is the deadly carrot (*T. garganica*), supposed to have been the source of the gummy accretion called "asadulcis" by the ancients, and esteemed by them as a drug. A resin is obtained by evaporating the tincture, and the amber-colored resin produced in Algeria is called bon-nafa. Thapsia was formerly employed as an acrid counter-irritant in plasters, for rheumatic and similar pains. *T. decipiens* is the black parsley of Madeira, with a thick umbrella, or palm-like, crown of finely-cut foliage three or four feet across. *T.* (*Monizia*) *edulis* is the carrot-tree, a woody plant, found on uninhabited islands near Madeira, the roots of which are sometimes eaten by visitors to the rocks.

Thaso, thā'sō, or **Thasos,** an island at the northern end of the Ægean Sea, off the coast of Macedonia. Its area is 167 square miles. It is nearly round, and about 16 miles in diameter. Excepting some low strips along the shore adapted to agriculture, it is covered by thickly wooded mountains, which in ancient times yielded gold and marble. The forests contain wood valuable for ship-building. Corn, fruit, oil, and wine are produced; wax, honey, and a superior marble are exported. The Phœnicians were attracted to the island at an early epoch by the gold-mines; and an Ionic colony settled there in 8 A.D. The island since then has changed hands several times, and now has an Egyptian ruler. The capital, ruins of which are still to be seen, was on the northern coast, on the site of the present landing-place of Limena. Pop. 12,100.

Thatcher, Henry Knox, American naval officer: b. Thomaston, Maine, 26 May 1806; d. Boston, Mass., 5 April 1880. In 1823 he entered the navy as midshipman and became a lieutenant 1833. In both attacks on Fort Fisher in 1862 he commanded the first division of Commodore Porter's fleet. After the Civil War he commanded the Gulf Squadron until 1866, and the squadron of the Pacific from 1866–8. He was made rear-admiral in 1866 and was retired 1868.

Thatcher, Oliver Joseph, American historical writer: b. Wilmington, Ohio. He was graduated from Wilmington College in 1878, and was instructor of ecclesiastical history at the United Presbyterian Theological Seminary 1888–90 and professor there 1890–2. He has published 'A Sketch of the History of the Apostolic Church' (1894); 'A Short History of Mediæval Europe' (1897); 'A General History of Europe' (1900), with F. Schwill; etc.

Thaxter, thăks'tĕr, **Celia Laighton,** American poet: b. Portsmouth, N. H., 29 June 1835; d. Island of Appledore, Isles of Shoals, 26 Aug. 1894. She spent her childhood and much of her later life at the Isles of Shoals. In 1851 she was married to Levi Lincoln Thaxter, who was accustomed to visit the islands long before they had become a popular summer resort. Her first published poem, 'Landlocked,' was printed by Lowell in the 'Atlantic.' The motive of subsequent verse is also generally the sea and coast scenery, though the arts, particularly music, claimed some of her attention. Its note is one of much original power. Her works are: 'Poems' (1872); 'Among the Isles of Shoals,' prose sketches (1873); 'Poems' (1874); 'Drift Weed' (1879); 'Poems for Children' (1884); 'The Cruise of the Mystery' (1886); 'Idyls and Pastorals' (1886); 'The Yule Log' (1889); 'An Island Garden,' a prose diary (1894); 'Letters' (1895); 'Stories and Poems for Children' (1895). A collected edition of the 'Poems' appeared in 1896. Consult the 'Letters'; also an article in the 'New England Magazine,' v. 24, pp. 166–172.

Thayer, thār, **Abbott Handerson,** American artist: b. Boston 12 Aug. 1849. He studied art, mainly under Gérôme, in the Ecole des Beaux Arts at Paris (1875–9), and chose as the subjects of his brush animals, landscapes, and genre. He has also executed some mural decoration.

Thayer, Alexander Wheelock, American biographer: b. South Natick, Mass., 22 Oct. 1817; d. Trieste, Austria, 15 July 1897. He was graduated from Harvard in 1843 and from the Law School in 1848. For a time he was assistant in the Harvard library and while there determined to write a life of Beethoven. In 1849 he went to Europe to collect material for this work, and lived abroad the greater part of his life. In 1859–82 he was United States consul at Trieste, Austria, and after that devoted himself entirely to his literary work. The first volume of his 'Life of Beethoven' appeared in 1866; the second in 1872, the third in 1879, and the fourth was nearly complete at the time of his death; it was published in German, although originally written in English. It deals with the life and character of the man Beethoven rather than with his musical work; and is very detailed, exact, and impartial. Thayer also wrote 'Signor Masoni' (1862) and 'The Hebrews and the Red Sea' (1883).

Thayer, Eli, American educator and inventor: b. Mendon, Mass., 11 June 1819; d. Worcester, Mass., 15 April 1899. He was graduated from Brown University in 1845; became principal of the Worcester Academy; and in 1848 founded The Oread, an institute for young ladies in Worcester. He was a member of the State legislature, 1853–4, and of Congress, 1856–61, and conducted an "Emigrant Aid Company" which settled portions of Kansas on the anti-slavery basis. Subsequently he acquired manufacturing interests in Massachusetts and received patents for a sectional safety steam boiler, a boiler-cleaner, and a hydraulic elevator. Besides his Congressional speeches (1860), he published a volume of 'Lectures' (1886), and 'The History of the Kansas Crusade' (1889).

Thayer, Emma Homan, American writer and artist: b. New York 13 Feb. 1842. She studied at the National Academy of Design, and was one of the original members of the Art League. Many figure paintings of hers have appeared from time to time at the National Academy exhibitions. Among her writings are: 'Wild Flowers of Colorado' (1887); 'Wild Flowers of the Pacific Coast' (1887); 'The English American' (1889); 'Dorothy Scudder's Science' (1901).

Thayer, Joseph Henry, American educator: b. Boston, Mass., 7 Nov. 1828; d. Cambridge, Mass., 26 Nov. 1901. He was graduated from Harvard in 1850, from Andover Theological Seminary in 1857, and was pastor of the Congregational Church at Salem, Mass., in 1859–64, being absent from his charge for nine months in 1862 when he served as a chaplain in the Union army. In 1864 he accepted the chair of sacred literature at Andover, which he resigned in 1882 to become professor of New Testament criticism at Harvard. He published 'A Greek-English Lexicon of the New Testament' (1869); 'A Biographical Sketch of Ezra Abbot' (1884); 'The Change of Attitude Toward the Bible' (1891); 'Books and Their Use' (1893); etc.

Thayer, Martin Russell, American jurist: b. Petersburg, Va., 27 Jan. 1819. He was graduated from the University of Pennsylvania 1840, and was admitted to the bar 1842. He was a member of Congress 1863–7, and became judge of the district court, Philadelphia, in 1867. In 1874 he was appointed presiding judge of the court of common pleas and resigned in 1896. He has published 'The Duties of Citizenship'; 'The Battle of Germantown'; 'Life and Works of Francis Lieber'; etc.

Thayer, Sylvanus, American soldier: b. Braintree, Mass., 9 June 1785; d. South Braintree 7 Sept. 1872. He was graduated at Dartmouth in 1807, and at West Point in 1808. For four years he was occupied, chiefly around Boston and New York, in the construction of coast-defenses. During the War of 1812 he served as chief engineer of the Northern Army on the Niagara frontier and at Lake Champlain, and as chief engineer and brigade-major in the defense of Norfolk, Va. After a tour of observation in Europe, where he studied fortifications and military schools, he became superintendent at West Point, a position which he held from 1819 to 1833. He was made president of the board of engineers, and placed in charge of the construction of defenses and harbor improvements around Boston. Upon these duties he was occupied during the remainder of his active service. He was retired 1 June 1863, having been commissioned colonel in the preceding March. He gave funds for a public library and an academy in his native town, and for founding the Thayer School of Civil Engineering at Dartmouth. In 1877 his remains were taken from South Braintree, where they were first buried, and interred at West Point, where in 1833 a statue was erected in his honor, bearing an inscription in which he is called the "Father of the United States Military Academy."

Thayer (Whitney), Eugene, American organist and composer: b. Mendon, Mass., 11

Dec. 1838; d. Burlington, Vt., 27 June 1888. He was for nearly 20 years a resident in Boston, where in April 1869 he gave the first free organ recital in the United States, and removing to New York in 1881 became organist of the Fifth Avenue Presbyterian Church. Besides a 'Festival Cantata' he composed a mass in E flat, many organ pieces and much vocal music. He received the degree of Doctor of Music from Oxford.

Thayer, William Makepeace, American Congregationalist author: b. Franklin, Mass., 23 Feb. 1820; d. Franklin 7 April 1898. He was graduated from Brown University in 1843, and was pastor of the Congregational Church in Ashland, Mass., from 1849 until 1857, at which date he resigned and devoted himself to writing. He was a member of the State assembly 1857–8 and 1863–4, and engaged in editorial work 1858–72. His publications, very popular in their day and chiefly for juvenile reading, include 'The Bobbin Boy' (1859); 'Youth's History of the Rebellion' (1863–5); 'Men Who Win' and 'Women Who Win' (1896); 'From Log Cabin to White House'; 'From Tannery to the White House' (1885).

Thayer, William Roscoe, American author: b. Boston 16 Jan. 1859. He was graduated from Harvard in 1881, was assistant editor of the Philadelphia *Evening Bulletin* 1882–5, and was editor of the 'Harvard Graduates' Magazine' from 1892. He has published 'Confessions of Hermes' (1884); 'Hesper' (1888); 'The Dawn of Italian Independence' (1893); 'Poems: New and Old' (1894); 'Throne Makers' (1899); 'History and Customs of Harvard University' (1898); 'A Short History of Venice' (1903).

Thayer School of Civil Engineering, a department of Dartmouth College (q.v.).

Theagenes (thē-ăj'ĕ-nēz) **and Chariclea,** kăr-ĭ-klē'a, a Greek romance written by Heliodorus, bishop of Trikka, in the 4th century. The story recounts the love and adventures of Theagenes, a Thessalian, and Chariclea, daughter of the queen of Ethiopia, and is the foundation of many later romances both by the early Greek fablers and the later French novelists, including Achilles Tatius among the former, and Gomberville, Scudéry, and D'Urfe among the latter. It was translated into English by Thomas Underdown (1577), and into French by Jacques Amyot (1586).

The'atines. See Orders, Religious.

Theatre, an edifice appropriated to the representation of dramatic spectacles. The theatre building of the Greeks and Romans was of a semicircular form, resembling the half of an amphitheatre and was not covered by a roof. The site chosen was generally the slope of a hill, and the seats for the audience were in most cases cut out of the rock in rows rising above each other in arcs of concentric circles, each arc being about three fourths of a circle. These rows of benches were divided at intervals into compartments by one or more broad passages parallel with the benches, and in which, when the house was well filled, many persons could find standing-room. Intersecting the rows of benches ran stairs leading from the lowest or front row to the highest or back row. The circular space immediately in front of the spectators was called the orchestra, and was the place on which the chorus performed its evolutions and dances, and which was therefore floored with boards. The stage was behind the orchestra, that is, farther from the spectators, on a somewhat higher level, and the chorus probably ascended to it by steps when it had to take a part in the real action of the drama. The back of the stage was closed by a wall.

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, and colleges, when superintended by churchmen, or in halls temporarily fitted up for the occasion when got up for the amusement of princes and nobles. In 1548 the Confraternity of the Trinity opened a theatre in Paris, in which they performed, in terms of their license, only secular pieces of a lawful and honest character. The first theatre building approaching the modern style was one constructed in 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 Theatre was built 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.

Modern theatres are all very much alike in their internal construction. The house is divided into two distinct portions, the auditorium and the stage, the former for the spectators, the latter for the actors and scenery, which is often of the most elaborate and realistic kind. The floor of the auditorium is always sloped down from the back of the house to the stage; several tiers of galleries or balconies run in a semicircular or horseshoe form round the house. On the ground-floor the front rows of seats are generally reserved as dress or orchestral seats. The seats in the galleries rise terrace-wise from the front, so as to allow the persons in the back rows to see on to the stage over the heads of those before them. Immediately in front of the stage is a space occupied by the orchestra. Part of the stage flooring is movable, either as traps through which actors or furniture ascend or descend, or in long narrow pieces which are drawn off at each side of the stage to allow the passage of the rising scenes. Adjoining the stage are the dressing-rooms for the performers, the green-room where they wait when dressed, etc. See Drama; Stage, American; Stage Mechanics.

Théâtre Français, tā-ätr frän-sā. See Comédie Française.

Théâtre Libre, lēbr, in France, a theatre, for the populace, subsidized by the government and admission to which is practically free to all citizens of the republic.

Thebes, thēbz (Egyptian *Net*, the *No* of the Bible; Greek *Thebai* or *Diospolis*), Egypt, a famous ancient city, whose ruins are situated on the banks of the Nile, 350 miles southeast of Cairo, near the modern villages of Karnak and Luxor. The ruins are among the most magnificent in the world. The largest is the great temple of Ammon at Karnak on the east bank of the river. It was begun during the Twelfth Dynasty and enlarged by the kings of the succeeding dynasties down to the time of the Ptolemies. It stands within a large enclosure which also contains several minor temples. An avenue of sphinxes leads to the main entrance, which is a huge pylon 142 feet high. This leads into a court measuring 276 by 338 feet, and traversed by a double line of colossal columns. A second pylon leads into the great hall or hypostyle, whose roof was supported by 134 columns in 16 rows. The columns of the two central rows are 78 feet high and 33 feet in circumference. All were brilliantly painted and sculptured, and many of the columns still retain their bright colors. Other pylons lead into the inner courts, one of which contains two obelisks 97½ feet high, and a colossal statue of Osiris. One of the obelisks is still erect. The entire structure is 1,200 feet long and about 350 feet wide. At Luxor, also on the east bank of the river, and a short distance south of Karnak, there are fine ruins of another temple of Ammon built by Amenophis III. and his successors. On the west bank the principal ruins are the Tombs of the Kings, hewn into the solid rocks of the hillside; the Ramesseum, a temple of Ammon built by Rameses II., and containing a colossal statue of that king; and the two Colossi of Memnon, 64 feet in height. One of these is the celebrated "vocal statue." Numerous other remains of tombs and temples are scattered over the neighborhood on both sides of the river. After the expulsion of the Hyksos Thebes became the capital of Egypt, and remained so until the beginning of the Twenty-first Dynasty. See also EGYPT.

Thebes (Greek, *Thēbai*), Greece, the principal city of Bœotia, was situated on an elevated plateau, south of Mount Phaga, its site now being occupied by the unimportant modern town of Thivæ (pop. 3,500), at the junction of the road leading north from Athens, with the transversal road leading from the Strait of Euripos on the east to the Gulf of Corinth on the west. It was one of the most celebrated cities of Greece, the birthplace of Pindar, Epaminondas, and Pelopidas. Cadmus, leading thither a Phœnician colony, is said to have founded the city by building the citadel called Cadmeia (1500 B.C.). The principal name in the legendary history of Thebes is that of Œdipus. The first recorded event in its history took place in 728 B.C., when Philolaus drew up a code of laws for the Thebans. During the Persian wars it lost much of its influence in Greece through its perfidious leagues with the Persians. In the Peloponnesian war the Thebans rendered important services to the Spartans; but they afterward, through jealousy of the Spartan power, joined the confederacy against them in 394. In 382, though peace then prevailed, Phœbidas, the Spartan commander, treacherously possessed himself of the Cadmeia, which was held by the Spartans until Pelopidas and Epaminondas headed a conspiracy which resulted in the death of the tyrants (378 B.C.). Open war now broke out between Sparta and Thebes, which resulted in the humiliation of the former by the crushing defeat of Leuctra (371). Thebes, under the brilliant leadership of Epaminondas and Pelopidas was now the leading state in Greece, but its supremacy departed when the former fell at the battle of Mantinea (362 B.C.). On the rise of the Macedonian power Thebes entered into an alliance with the Athenians and other Greeks against Philip. After the battle of Chæronea (338 B.C.) it was obliged to receive a Macedonian garrison. On Philip's death an insurrection broke out in Thebes, and an attempt was made to drive the Macedonians from the Cadmeia. But Alexander hastened to their relief, captured and destroyed (336 B.C.) the city, and reduced the inhabitants to slavery. Twenty years afterward Cassander rebuilt Thebes; but it never recovered its former importance. In the war of the Romans against Mithridates, king of Pontus, it joined the latter out of gratitude to Athens, and was severely chastised by the Romans. From this time the Thebans gradually disappear from history.

Thecla, thĕk'la, **Saint**, the female protomartyr of the Church. Born of a noble family of Iconium in Lycaonia, she was converted by the preaching of Saint Paul, followed him to Antioch and devoted herself to a life of virginity. As a consequence, she suffered a series of persecutions from her fiancé and her parents, who eventually denounced her to the authorities as a Christian, and she was thrown to the wild beasts in the theatre; but the fierce animals refused to hurt her, and she escaped unscathed from the flames to which she was subsequently exposed. After the death of Saint Paul she lived to a ripe old age in a cell near Seleucia. She is the heroine of a Christian romance of the 2d century called 'The Acts of Paul and Thecla.' Consult: Schlan, 'Die Akten des Paulus und die ältere Theklalegende' (1877); Ramsay, 'The Church in the Roman Empire.'

Thecoph'ora, a suborder of *Chelonia* (q.v.), containing all except the leathery turtles (*Athecæ*). It is defined by anatomical characters, the most conspicuous of which is the exclusive possession of horny epidermal shields or plates on the shell. Consult Gadow, 'Amphibia and Reptiles' (New York 1901).

Theft is a term sometimes used as synonymous with larceny, although it is less technical, and signifies the secret and felonious abstraction of the property of another with the intention of converting it to the taker's use, and without the consent of the owner.

Theine, $C_8H_{10}N_4O_2$, more often called caffeine, an alkaloid found in tea, coffee, Paraguay tea, guarana, etc. It may be prepared synthetically by action of methyl iodide on theobromine. Usually obtained from tea dust which contains from 2 to 4 per cent white silky needles, slightly soluble in cold water and alcohol, possessing a somewhat bitter taste, and forming salts with

HALL OF COLUMNS IN THE TEMPLE OF KARNAK

(Restored)

acids. It is used in medicine as a nerve stimulant.

Theism, the doctrine of the existence of a God, or Gods. It may take the form either of monotheism or polytheism, and is opposed only to atheism, which denies the existence of such divine beings. From its use to express the belief of cultured Christian peoples, the term has been given a more restricted meaning. Thus, theism has been identified with monotheism, as implying belief in one God, and hence is distinguished from all forms of polytheism. Further, theism is distinguished from pantheism on the one hand, and deism on the other. Pantheism (q.v.) merges God with the world-process and thus practically denies his personality. Deism (q.v.) emphasizes the personality of God, but conceives him as existing apart from the world of his creation. Theism endeavors to rise above both of these extremes and embrace the truth contained in each. On the one hand it maintains the personality of God and his transcendence of the world. On the other it insists upon the immanence of God, upon his presence in the world as its controlling and life-giving agency. Thus the God of theism is at once the Author and the Preserver of the world. In every age and among every people of history, some form of theism is to be found as the basis of religious observance. This belief is refined and developed with the progress of thought and civilization, and the direction of this development is generally in the line above mentioned, from polytheism to monotheism, and on to a comprehensive theism. Thus the traditional polytheism of Greece broke down under the influence of philosophic reflection; but this reflection itself culminated in the theistic philosophy of Aristotle. As the theoretical basis of religion and the ultimate explanation of the universe, theism has always had a prominent place in systematic reflection. In the earlier centuries of the Christian era it was the topic of supreme importance, and the best effort of theologians and philosophers was given to its discussion and exposition. As a result, certain proofs for the existence of God were formulated, the most important of which possess considerable historic interest. We may mention three of these arguments: (1) The Ontological argument, first proposed by Anselm, infers the existence of God from the idea of a most Perfect Being. The presence of this idea in the human mind entails the existence of such a Being, for existence is one of the perfections necessarily contained in the idea of Most Perfect Being. (2) The Cosmological argument was adapted from Aristotle, and proceeds upon the principle that every effect must have a cause. The world is such an effect. It is impossible to suppose that the series of natural causes goes back to infinity, and consequently we are compelled to assume the existence of a Divine First Cause, adequate to account for the existence of the world. (3) The Teleological argument is based upon the evidences of design in the world, and infers therefrom the existence of a designing mind as its Author. These formal arguments were subjected to a destructive criticism by the philosopher Kant at the end of the 18th century. He attempted to show how they depended one upon the other, and all contained contradictions and inconsistencies. Kant held that the moral argument was the only possible proof for the existence of God. This argument maintains that the existence of right and duty presupposes the existence of a God who will ultimately proportion happiness to virtue and *vice versa*. Kant's criticism was effective in destroying the force of the three above-mentioned proofs in their traditional formulation. Evolutionary science has also contributed to lessen the force of the cosmological and teleological arguments in their earlier and cruder statement. If the present complex condition of the world is the result of a slow process of development from a simpler condition, the need for a First Cause of the present world is less apparent. If present organic structures owe their existence to their utility (that is, are the result of natural selection, q.v.), their purposiveness is explained by natural causes. But all such criticism, including that of Kant, is effective rather against the form than the substance of theistic argument. It has led only to a reconstruction of old arguments and their statement in a more adequate and convincing manner. Thus it would seem that the arguments for the existence of God are rather stronger than weaker, as the result of criticism. We can only indicate in outline what form some of these arguments have taken in recent years. (1) Belief in God is justified by the needs of human thought. The constant endeavor of the human mind, in its thought, is to introduce more perfect unity, more complete system, into its knowledge. The idea of God by virtue of its all-inclusiveness, is required as the final instrument of organization to make this unity complete; for by it the self and the world are adjusted as elements of one universal life. Thus the idea of God proves its own reality by its function in knowledge. (2) The existence of God is evidenced by the nature and development of the world. In the natural world we have a series of events related as cause and effect, and each dependent upon the other. Since each component part is dependent upon and determined by some other part, it is impossible to conceive the whole series as standing alone. It is rather by its very nature dependent, and requires for its existence and support some ground or underlying principle that is self-determined. From the nature of the world as dependent and relative, therefore, we are led to believe in the existence of an Underlying Principle that is self-determined and absolute. If we consider next the development which the natural world has undergone, we see its culmination in man with his intelligence and civilization. The character of the underlying principle or ground of any process will, of necessity, be more completely manifested as the process unfolds. Thus the intelligence and personality of man, as the outcome of the natural order, reveal to us the intelligence and personality of its Ground. (3) The ideals of human activity, both theoretical and practical, presuppose the existence of a God. The thought of man has an ideal, Truth, for which it ever strives. Yet Truth exists in no single human mind, neither is it the possession of the race. Truth as an end is too real to be imaginary, but if real it must exist somewhere. We are forced then to assume a divine mind in which Truth exists in all completeness. The same is true of the Good, the ideal of human conduct. That Good which, as moral ideal, exercises absolute authority over all men, is rela-

tive neither to individual desires nor to the desires of a society of individuals. Here, too, we are obliged to assume a Divine Personality whose plans are realized in the moral order, and whose purposes are represented in the moral ideal.

Consult: Flint, 'Theism'; Fraser, 'Philosophy of Theism'; Caird, 'Evolution of Religion'; Schurman, 'Belief in God'; Royce, 'The Concept of God.'

H. W. WRIGHT,
Cornell University.

Theiss, tīs, or **Tisza**, tĭs'ŏ, Hungary, the largest tributary of the Danube and one of the most important of the country, rises in the Carpathians, being formed by the junction of numerous small mountain streams. Its course is first northwest, then southwest and west, until, after a circuitous course, it empties into the Danube. Its entire length is 750 miles, 300 of which are parallel to the Danube. The principal affluents are the Maros and Bodrog. The cities on its route are Tokay, Szolnok, and Szegedin, which frequently suffer from its overflow. A memorable inundation was that of 1879, when Szegedin was overwhelmed and the entire population lost everything; the loss including many lives.

Thellusson, tĕl'lŭs-sŏn (Fr. tā-lü-sôń), **Peter**, London merchant: b. Paris 27 June 1737; d. London 21 July 1797. He settled in London in 1762, and opened a commission house, and later acquired a large fortune by trade with the West Indies. The singular terms of his will, dated 2 April 1796, gave occasion to the passing of an act of Parliament known as the Thellusson Act. He left to his widow and family about £100,000, and the remainder, amounting to more than £600,000, he left to trustees, to accumulate during the lives of his three sons, and the lives of their sons. On the death of the last survivor the estate was to be divided equally among the eldest male lineal descendants of his three sons then living. If there were no heir the property was to go to the extinction of the national debt. This will, being contested by the heirs at law, was finally established by a decision of the House of Lords, 25 June 1805. An act of Parliament, however, was soon after passed (39th and 40th George III., ch. xcviii.), restraining the power of devising property, for the purpose of accumulation, to 21 years after the death of the testator. Thellusson's last surviving grandson died in 1856, and the final disposal of the property was not settled without an expensive and protracted lawsuit lasting until 1859; when in consequence of mismanagement and the costs of litigation the surviving heirs received but a small sum.

Theme, in music, is the subject or leading melody in a composition; in a fugue it is successively repeated or imitated in the same or in a different key by the various parts. Originally simple, themes are frequently more or less disguised by groups of ornamental notes, called variations, which serve too often merely to show off the performer's flexibility of voice or nimbleness of fingers. See MUSIC.

Themis, thē'mĭs, in Greek mythology, a Titaness, daughter of Uranus and Ge (Heaven and Earth); according to some, of Helios, or the Sun. She was for a time a dweller in the oracular temple at Delphi, but she left it to become consort to Zeus. She became by him the mother of the Hours and the Fates (Moiræ); and her daughter Dike, the goddess of justice, is often confounded with her. Consult: Ahrens, 'Ueber der Göttin Themis' (1864).

Themistocles, thē-mĭs'tō-klēz, Greek general and statesman: b. Athens about 514 B.C.; d. Magnesia, Asia Minor, 449 B.C. He early displayed unusual ability and great ambition. The ostracism of Aristides in 483 was in part due to his influence, and he thereupon became the political leader in Athens. He was elected archon eponymus in 481, and when the second invasion of Greece by Xerxes was threatened he obtained command of the Athenian fleet, which through his exertions had been built from the income derived from the Laurium silver mines. He consented to fight under the Spartan commander in the battle off Artemisium, and when, through neglect of his advice, the pass of Thermopylæ was forced and the Persian hordes overran Bœotia and advanced upon Athens, he persuaded the Athenians to convey their women and children to places of safety, abandon the city to the Persians, and those capable of bearing arms to take to the ships. The exiles, among whom was Aristides, were recalled, and the command of the Greek fleet was entrusted to a Spartan, Eurybiades. The battle of Salamis (480) resulted in a signal victory for the Greeks, and Themistocles, to whom the success was mainly due, now became the leader not only of Athens, but of Greece. When Athens was rebuilt he contrived the strengthening of the city walls, and through his influence Piræus, the principal port of Athens, was connected with the city by the "Long Walls." From this time the glory of Themistocles declines. He had gained the hatred of the Spartans by building the walls of Athens so strongly and he was now accused by them of treasonable negotiations with the Persians. He was acquitted of this charge, though he was ostracized in 471 by his countrymen, who had become aware of his unscrupulous character and his inordinate love of riches, which he was accused of gratifying by unjust means. He retired to Argos, thence fled to Epirus, and ultimately sought protection at the Persian court, where he gained high favor with the reigning monarch, Artaxerxes Longimanus. He was deeply engaged in plans for the subjugation of Greece by the Persians, which he had promised Artaxerxes to compass, when, knowing the impossibility of fulfilling his promises, according to some accounts, he took poison; others, however, ascribe his death to natural causes. His career shows a curious admixture of noble and sagacious statesmanship and sordid ambition. He was possessed of great eloquence, and was undoubtedly the savior of Athens and Greece at the crisis of Salamis.

Thénard, tā-när, **Louis Jacques**, French chemist: b. Louptiere, Champagne, 4 May 1777; d. Paris 21 June 1857. He studied chemistry in Paris under Fourcroy and Vauquelin, becoming the assistant of the latter, who procured him a professorship at the Collège de France (1804). Subsequently he succeeded Fourcroy in the chair of chemistry at the Ecole Polytechnique, as well as in his seat in the Academy. In 1825 he was made a baron by Charles X.

and in 1832 a peer of France by Louis Philippe. It was while attempting to verify a theory he had propounded in the lecture-room that he made his important discovery of the peroxide of hydrogen. He worked with the chemist Gay-Lussac (q.v.), and made noteworthy original investigations, including those of the compound ethers, of bile, and of sebacic acid. He discovered the method of preparation of a cheap cobalt blue, since known as "Thénard's blue." His chief publications are a 'Treatise on Elementary Chemistry' (4 vols. 1813–16); and 'Physico-Chemical Researches' (with Gay-Lussac, 1816).

Thenar'dite, a mineral identical in composition with the artificial sodium sulphate, Na_2SO_4. It is brittle, of vitreous lustre, white color, transparent to translucent, hardness 2 to 3, and specific gravity 2.68. It crystallizes in the orthorhombic system, often in tabular, cross-twinned forms, with distinct basal cleavage. It is entirely soluble in water; natural crystals speedily absorb water and effloresce. It often occurs dissolved in the waters of salt lakes, from which it is separated in crystal form during the summer season by evaporation. The most important American localities of this type are Borax Lake, California, and Rhodes Marsh, Nevada. Vast deposits exist on the Rio Verde in Arizona. It is of value in the preparation of soda.

Theobald, thē'ō-bâld, **Lewis,** English dramatist and Shakespearian scholar: b. Littingbourne, Kent, 2 April 1688; d. London 20 Sept. 1744. His classical attainments were considerable and by 1715 he had published translations of Plato's 'Phædo'; the 'Electra,' 'Ajax,' and 'Œdipus Rex' of Sophocles, and the 'Plutus' and 'Clouds' of Aristophanes. He made attempts at verse and tragedy, but succeeded in neither. In 1725 Pope published his edition of Shakespeare, and in 1726 Theobald appeared with a work entitled 'Shakespeare Restored, or a Specimen of the Many Errors as well Committed as Unamended by Mr. Pope in his late edition of this poet: designed not only to correct the said edition, but to restore the true Reading of Shakespeare in all the Editions ever published.' Though Pope made grudging use of the manifestly improved readings suggested by Theobald in his second edition, he never forgave the detection of his incompetence as an editor and in the first edition of the 'Dunciad' Theobald figured as hero. In 1733–4 Theobald published an edition of Shakespeare in seven volumes, in the preparation of which he had the assistance of Concanen, Thirlby, and Warburton. Textual criticism of Shakespeare owes much to him, for he was the first to discard corrupted readings and in his emendations displayed knowledge, tact, and good sense. Subsequent editors have depended much upon him and have adopted his corrections. At the time of his death he was engaged on an edition of the works of Beaumont and Fletcher, six plays of which he had already completed.

Theobroma Cacao. See CACAO.

Theobro'mine, $C_7H_8N_4O_2$, a white crystallizable alkaloid found in the chocolate prepared from the seeds of the cocoa tree. It forms salts with acids, is bitter, soluble in alcohol, slightly so in water. It is closely related to caffeine, the active principle of tea and coffee, into which it can be readily changed. Caffeine may be considered as theobromine in which one hydrogen atom has been replaced by the methyl group (CH_3). It is not used to any extent in medicine, although it has a slight sedative action on the nervous system.

Theoc'racy (from Gr. *Theos,* God, and *kratos,* power) is that government of which the chief is, or is believed to be, God himself, and the laws the commandments of God. The priests in such a government are the promulgators and expounders of the divine commands, the representatives of the invisible Ruler. The most notable theocratic government of all times was that established by Moses among the Israelites. The Puritan government of Massachusetts was also called a theocracy, owing to the claim that it was conducted on the principle of obedience to divine laws, and the requirement that all should contribute to the support of the Church, and attend church services.

Theocritus, thē-ŏk'rĭ-tŭs, Greek bucolic poet: b. Syracuse, according to others at Cos, and flourished about 280 B.C. He was a pupil of Philetas at Cos. Having gone to Egypt, he was treated with much distinction by Ptolemy Philadelphus, in whose praise he wrote Idyls 14, 15, and 17, but afterward returned to Syracuse, where he appears to have been on terms of some intimacy with Hiero II. We have under his name 30 idyls, or pastoral poems, of which, however, several are probably by other authors. The most doubtful are 12, 23, 26, 27, 29. He is to be considered the creator of this species of poetry as a branch of Greek literature, though the elements of it existed before his time among the Dorians both of Sicily and Greece. Most of his idyls have a dramatic form, and consist of the alternate responses of musical shepherds. They present fresh and vivid pictures (εἰδύλλια, little pictures) of common life in Sicily, and are marked by considerable comic, and, though to a less extent, tragic power. They are of a different sort from the affected compositions representing the "imaginary shepherds of a fictitious Arcadia." Writing generally in the Doric, though in two cases (Idyls 28, 29) in the Æolic, dialect, which is peculiarly adapted to the simplicity of rural life, his language is strong and harmonious. His metre is chiefly the heroic hexameter. Besides the idyls he wrote a poem called 'Berenice,' of which only five lines and a word are extant, and 22 epigrams in the Greek Anthology. He was imitated by Vergil (q.v.) in the 'Eclogues'; Tennyson's indebtedness to him has been well shown by Stedman in a chapter of the 'Victorian Poets' (1876). The best editions of his works (which are usually joined with those of Moschus and Bion) are those of Meineke (1856); Paley (1863); Wordsworth (new ed. 1877); and Fritzsche (3d ed. by Hiller, 1881). There are renderings into English verse by Chapman (1866) and Calverley (1869), and into prose by Lang (with introduction, 1889). The 7th and 11th idyls are translated in verse by Leigh Hunt ('A Jar of Honey,' 1848). Consult, besides the above-mentioned works: Fritzsche, 'Zu Theokrit und Virgil' (1860); Knapp, 'Theokrit und die Idyllen-

Dichtung' (1882); Von Christ, 'Griechische Litteraturgeschichte' (3d ed. 1898).

Theodicy, a term of Leibnitzian philosophy, in which the existence of physical and moral evil is made reconcilable with the existence of a righteous God, the controlling providence of the best of possible worlds. See LEIBNITZ.

Theod'olite. See SURVEYING INSTRUMENTS.

Theodora, thē-ō-dō'ra, Byzantine empress consort of Justinian I.: b. 508 A.D.; d. 548. She was, according to the dubious evidence of Procopius, the daughter of Acacius, a bear-ward at Constantinople; and had already been by turns actress, dancer, and harlot, when she won the heart of the austere and ambitious Justinian, to become in succession his mistress, his wife, and the sharer of his throne (527). Never thereafter did the breath of scandal touch her name; she became Justinian's trustiest counsellor, bore a chief share in the work of government, and saved the throne by her high courage at the crisis of the Nika riots (532). "Now every man must die once," said she in council, "and for a king death is better than dethronement and exile. . . . If you wish, O emperor, to save your life, nothing is easier; there are your ships and the sea. But I agree with the old saying that 'empire is the best winding-sheet.'" She lavished her bounty on the poor.

Theodore I., thē'ō-dōr, of Corsica, otherwise Baron Theodore de Neuhoff, German adventurer: b. Metz about 1686; d. London 11 Dec. 1756. He was the son of a Westphalian nobleman and engaged in the French, Swedish, and Spanish service successively. In 1732 he went to Florence as *chargé d'affaires* for Emperor Charles VI., and taking part in a Corsican uprising against Genoa through funds furnished by the Bey of Tunis, was proclaimed king of Corsica in 1736. Soon after, however, he was driven to flight; but made two subsequent attempts to reinstate himself in 1738 and in 1743. In 1749 he settled in London, where his creditors put him in prison; but his release was gained through the support of Walpole. By his wife, an Irish lady whom he robbed and deserted, he had one son known later as Col. Frederick, author of 'Memoirs pour servir à l'histoire de Corse' (1768).

Theodore II., king of Abyssinia: b. province of Kwara 1818; d. Magdala 14 April 1868. Originally named Kasa or Kassa, he led a revolt in 1854 against Ras Ali, ruler of Abyssinia (q.v.), whom he defeated. Later he got himself crowned under the title of Theodorus, king of kings, of Ethiopia. He was a man of strong personality, an enemy of Islamism, a ruler and a reformer. He became intolerant of any power other than his own, and with the quick suspicions of a barbarian took offense at what he considered as slights. His quarrel with Great Britain was brought on by the injudicious conduct of the English consul, Capt. Cameron, sent to him in 1861, and by the failure of the English government to respond to his overtures regarding the reception of his ambassador at the English court. He finally imprisoned Cameron and also Hormuzd Rassam, a Turk but an English subject, sent to treat with him concerning Cameron's release. As a condition of setting the prisoners at liberty Theodore requested that certain skilled artisans be sent him, together with presents that he had been led to expect. The English detained the artisans and presents at Massowah, awaiting the release of the prisoners; but as they were not delivered up, war was declared, and an expedition under Sir Robert Napier began a progress toward Magdala in the latter part of 1867. The city was reached, and active hostilities began on 10 April 1868. On the 14th the city was taken, and Theodore was found dead. The besiegers were informed that he had committed suicide.

Theodore of Mopsues'tia, Greek ecclesiastical writer: b. Antioch; d. 428 A.D. He studied rhetoric under Libanius, philosophy under Andragathus, and sacred literature under Flavianus of Antioch, Diodorus of Tarsus, and others. Early in life he followed the example of his fellow-student and intimate friend John Chrysostom in turning monk, although he had been on the point of marrying a lady of Antioch named Hermione. After being ordained priest he distinguished himself as an opponent of Arius, Apollinarius, and others. From Antioch he removed to Tarsus, and in 393 was chosen bishop of Mopsuestia in Cilicia. In 394 he preached before the Emperor Theodosius at Constantinople, and was present at the council held in that city at that date. He was a voluminous writer, the most important of his works being commentaries on the Bible, and polemical treatises. These were held in great repute among the Syrian churches, and many of them were translated into Syriac, Arabic, and Persian. His views approximated to those of Pelagius, and Nestorius was to be his disciple. In the Eastern Church, accordingly, he was condemned as a heretic at the Fifth Ecumenical Council, held at Constantinople 553.

Theodoret, thē-ŏd'ō-rĕt, church historian and theological writer: b. Antioch late in the 4th century; d. 457. He was educated in a monastery near Antioch, where he had Nestorius and John of Antioch for fellow-pupils. After 25 years' study and retirement he succeeded Isidorus as bishop of Cyrus, a city about two days' journey from Antioch. He endeavored to play the part of mediator between Nestorius and Cyril of Alexandria, but could effect no reconciliation. In 431 Nestorius was deposed by the Council of Ephesus, an act which Theodoret at first protested against, but later on excused. When the Nestorians were prosecuted with relentless severity, he stood forth as the champion of Nestorius against Cyril and his successor Dioscorus. The latter accused Theodoret of Nestorianism, pronounced a public anathema upon him in the church of Alexandria, and (449) procured his deposition at the so-called robber council of Ephesus, a sentence which was reversed by the general council of Chalcedon (451). The most important of his work, of which a complete edition was published by Schulze and Nösselt (1769–74), consist of commentaries on the Old Testament and on the Pauline epistles; 'Ecclesiastical History,' in five books, beginning with the history of Arianism under Constantine the Great, and ending with the death of Theodore of Mopsuestia; 'Religious History,' a narrative of the lives of the hermits, called the Fathers of the

Desert; 'Eranistes,' three dialogues against the Eutychians, and 'History of Heresies.' Consult: Binder, 'Etudes sur Théodorète' (1844); Gaisford, 'Theodoreti Historia Ecclesiastica' (1854); Bertram, 'Theodoreti Doctrina Christologica' (1883).

Theodoric I., thē-ŏd'ō-rĭk, king of the Visigoths. He was chosen successor to Wallia about 419 A.D., and became desirous of extending his kingdom, especially so as to embrace the neighboring Roman cities of Arles and Narbonne. For this purpose he made war against the Romans after the death of Honorius in 423, and continued with varying results until 437, when he entered into an alliance whose exact terms are unknown. By 450 he came into closer alliance with the Romans in the endeavor to check the advance of Attila, who led his barbarian army across Lorraine and Champagne and captured the city of Orléans. Theodoric and Aëtius, the Roman general, encountered Attila near the village of Moirey, a few miles from Troyes, and fought the battle generally known in history as that of Châlons-sur-Marne, in 451. Theodoric was killed by an arrow; but the progress of Attila was checked and western Europe was saved from the domination of barbarism.

Theodoric II., son of Theodoric I. He was a member of the party who wished to remain on terms of peace with Rome, and when his brother Thorismund, who had succeeded Theodoric I., began to levy war against the Romans he took part in a rebellion that ended in the murder of Thorismund and his own elevation to the throne. As vassal of the Roman emperor Avitus he made an expedition against the Sueves, conquered and put to death their king, and was in a fair way of completing the conquest of Spain, when Avitus was deposed and killed, and Theodoric ceased his efforts. In 466 he was murdered by his younger brother Euric.

Theodoric the Great, king of the Ostrogoths: b. about 454; d. 526. His father, Theodemer, was one of the three brothers who jointly ruled the Ostrogoths settled in Pannonia; and he sent him, when only eight years of age, to Constantinople as a hostage, to secure the conditions of a treaty between the Goths and the Emperor Leo. After residing ten years with that emperor he was restored to his father, then sole monarch of the Ostrogoths. On the death of Theodemer, about 474, he succeeded to the crown, and began a course which, after menacing the safety of the Greek empire, and Constantinople itself, terminated in an expedition against Odoacer, who had assumed the title of king of Italy. After several bloody engagements the latter was finally induced to yield, on condition that he and Theodoric should govern Italy with equal authority (493). The murder of Odoacer at a banquet soon followed this agreement; on which Theodoric caused himself to be proclaimed king of Italy, and he governed with extraordinary vigor and ability. He attached his soldiers by assigning them a third part of the lands of Italy, on the tenure of military service; among his Italian subjects he encouraged industry and the arts of peace. He improved the administration of justice, issued edicts to protect the public monuments at Rome and elsewhere, and assigned revenues for the repair of the public edifices. Like his ancestors he was an Arian, but was indifferent to controversy, and never violated the peace or privileges of the Roman Catholic Church. The particulars of the government of this memorable prince, who shed a short-lived lustre on the Gothic name, are recorded in 12 books by his secretary, the senator Cassiodorus, a man of learning, who induced his illiterate master to become a patron of letters. The senators Boethius and Symmachus were both put to death on the mere suspicion of an intrigue between a senatorial party and the imperial court. This cruel act had no sooner been perpetrated than Theodoric was seized with remorse; and a fever ensued, which terminated his life in three days. The ordinary residence of this king was at Ravenna, above which city his daughter Amalasuntha erected a splendid monument to his memory.

Theodo'sia. See Feodosia.

Theodosius (thē-ō-dō'shĭ-ŭs) **the Elder,** Roman general: d. Carthage 376. He was the father of the Emperor Theodosius I. (q.v.), called "the Great." By birth a Spaniard, he rose to high rank in the Roman army, and in 367 was sent by Valentinian I. to Britain, where he repelled the invasions of the Picts and Scots, strengthened the military defenses, and restored order. He formed the country between Hadrian's wall and the Forth and Clyde into a new province, which he named Valentia, and then returned to Rome. He was later stationed on the Upper Danube, where he was victorious over the Alemanni, and in 372 he quelled the revolt in Africa led by the formidable Moorish chieftain Firmus. He was beheaded at Carthage in 376 by order of Valens, on some unknown and probably unjust charge.

Theodosius (surnamed The Great), Roman emperor: b. Spain about 346; d. Milan January 395. At a very early age he obtained a separate command; but on the execution of his father he sought retirement, until selected by the Emperor Gratian, in 379, for his partner in the empire. To his care were submitted Thrace and the eastern provinces, which he delivered from an invasion of the Goths, whom he signally defeated in two battles, concluding a peace with them in 382. On the defeat and death of Maximus at Aquileia (388) he became the sole head of the empire, Gratian having been previously killed in the war against Maximus. He administered the affairs of the West in the name of Valentinian, the son of Gratian, then a minor. He entered Rome in triumph in 389, and passed three years in Italy. In 390 a sedition took place in Thessalonica, which resulted in the murder of the governor and several of his officers. The resentment of Theodosius was natural and merited; but the manner in which he displayed it was in the highest degree detestable and inhuman. An invitation was given in the emperor's name to the people of Thessalonica to an exhibition at the circus, and when a great concourse of spectators had assembled they were massacred by a body of barbarian soldiery to the number, according to the lowest computation, of 7,000. Theodosius was at this time at Milan, of which Saint Ambrose was bishop, and this prelate, on account of such an atrocious proceeding, resolutely refused him communion for eight months. About

this time the emperor crowned his merits, as a foe to paganism, by demolishing the celebrated temple of Serapis and all the other heathen temples of Egypt; and he issued a final edict prohibiting the ancient worship altogether. On the murder of Valentinian by Arbogastes, and the advancement of Eugenius in his place (392), the emperor carried on a war against the latter, which finally terminated in his defeat and death. Theodosius did not long survive this success. Consult Gibbon, 'Decline and Fall.'

Theodosius II., Roman emperor, son of Arcadius, and grandson of Theodosius I.: b. 401; d. 450. He became emperor in 408, but proved a weak ruler, and the actual government was in the hands of his sister, and of his wife during the greater part of his reign, in which the Theodosian code of laws was compiled. He was killed by a fall from his horse, and was succeeded by his sister Pulcheria.

Theodosius III., emperor of Constantinople. He held the unimportant post of collector of the revenue when he was nominated to succeed Anastasius, and he was crowned in 716. He resigned in favor of Leo the Isaurian in 717, and retired to a monastery.

Theognis (thē-ŏg'nĭs) **of Megara**, Greek elegiac poet. He lived between 540 and 500 B.C. There are 1,389 verses preserved under his name, of importance in enabling us to understand the state of parties and the problems of society in the Greece of that time. They were translated by Frere (1842), and are found in the original in Bergk's 'Poetæ Lyrici Græci.'

Theog'ony, a poem treating of the generation and descent of the gods. The most ancient Greek theogony known to us is that of Hesiod, the earlier Theogonies of Musæus and Orpheus having perished.

Theological Education, the training especially designed to prepare for the work of the ministry. It was early in the Christian era an important part of education, but it was during the Middle Ages that the theological curriculum was most systematically developed. Theological training was at first given largely at the bishops' residences; later these bishops' schools were supplemented by the work of the monasteries; and then by the theological *collegia* of the universities. Up to the time of the Reformation, special attention was given to philosophical-religious studies and dogmatic theology to the neglect of the historical and critical. With the Reformation and the counter-Reformation in the Roman Catholic Church came the establishment of the curriculum for the Catholic diocesan seminaries by the Council of Trent, and the raising of critical and historical study of the Bible, church history, and moral theology to a position of importance; pastoral theology was added in the 18th century. The Protestant theological education on the Continent was from the first provided for by the theology faculties of the great universities where the Protestant religion became the established religion of the state; and it is still centred in these institutions. In England the students for the ministry in the Established Church are also educated at the universities, and may be examined on certain theological books in addition; the Established Church also maintains several theological seminaries; and the various dissenting denominations have established schools for theological training, with which collegiate departments are usually connected.

In the United States.— The foundation of the first institutions of higher learning, Harvard, Yale, Princeton, etc., was due primarily to the desire to provide for an educated ministry, and made tuition free to candidates for the ministry who could not pay their own expenses. By the close of the 18th century the colleges had so far departed from the special purpose of their creation that the necessity for separate schools of theology was felt. Of the theological seminaries now in existence the first was the Seminary of the Dutch Reformed Church at New Brunswick, founded in 1784; the first Roman Catholic seminary was that of Saint Mary's, Baltimore, Md., founded in 1791; and the first Presbyterian seminary was founded at Service, Beaver County, Pa., in 1794, and later moved to Xenia, Ohio, where it is now located. These three were the only existing seminaries established before the 19th century. The first Congregational seminary was opened at Andover, Mass., in 1808, the first Lutheran seminary in Otsego County, N. Y., in 1815, the first Protestant Episcopal seminary in New York in 1819, the first Baptist seminary at Hamilton, N. Y., in 1820 (now a department of Colgate University), the first Methodist seminary at Newbury, Vt., in 1840 (now a department of Boston University). Since the establishment of the separate schools, the fact has been recognized that the work of the theological seminary and the training of the ministerial student was narrowed by isolation from other departments of learning. This has led to the organizing of theological departments in numerous colleges and universities or the affiliation of existing theological schools with other institutions. Harvard was the first to organize such a department in 1819, and Yale followed in 1822. In 1902 of the 148 theological schools reported in the United States education report, 45 were affiliated with colleges and universities, of which number 6 were Roman Catholic. In other cases, theological schools not directly affiliated, are located near universities, and their students enjoy the privileges of entering certain university classes. Such relations exist, for example, between the Episcopal Theological School at Cambridge and Harvard University, between Princeton Theological Seminary and Princeton University, between the Episcopal Divinity School at Philadelphia and the University of Pennsylvania, between Union Theological Seminary and Columbia and New York universities.

Roman Catholic Seminaries.— The Roman Catholics have more theological seminaries in the United States than any other one denomination, reporting 30 in 1902. These are the diocesan seminaries for the training of men for the priesthood. The curriculum is but little changed from that outlined by the Council of Trent, and includes biblical criticism and exegesis, biblical theology, church history, systematic theology (including apologetics and dogmatics), practical theology (including homiletics), and canon law. This theological course usually extends over four years; connected with this course, in most seminaries, there is a subordinate philosophical course of two years, including metaphysics, logic, psychology, ethics and sociology, the sciences, Hebrew and Greek.

In response to the «spirit of the age,» increasing importance is given to psychology, the sciences, and sociology, and to the historical and critical study of the Bible and Church history; the modern methods of research and independent reasoning are encouraged in so far as they do not conflict with the Church's articles of faith.

Protestant Seminaries.— These seminaries have been established by different denominations for the education of their own ministry; in 1902 but three seminaries in the United States were non-sectarian; these were the theological department of Howard University, Washington, D. C., the Harvard Divinity School, and the Philadelphia Theological School of Temple College. As has been said, the need of an educated ministry was felt in the early days of the nation's history, and led to the founding of the earliest colleges; but as the college ideal broadened and changed, the need for some other provision for the education of the minister increased. With the growing complexity of modern life, the numerous social and ethical questions which the church and the ministry must meet, and the widely differing opinions concerning certain theological questions, the need for a special education for the ministry as well as for the other professions becomes ever more apparent. This need the modern theological seminaries seek to satisfy. Their aim, then, is not to do the work suited to the college and general schools, but to provide a scientific training in theological studies and in the principles of pastoral work; fitting men to meet the questions and to the work of the pastor in whatever conditions they may be placed. The principal studies of the theological course, which usually extends over three years, are Hebrew and Old Testament exegesis, Greek and New Testament exegesis, church history, systematic theology, pastoral theology, and homiletics. Though the subject matter of theological study has varied but little, the methods of study have been changed with the change in modern educational ideals; increasing emphasis has been laid on historical and critical study in accordance with the principles of modern historical research, and on the importance of independent reasoning and special investigation on the part of the individual student, with a tendency toward the seminar method. The ethical and social side of Christianity has recently become a question of special importance to the church in its contact with the social problems of the world; and hence to the institutions for the training of the ministry. The seminaries, therefore, are tending toward bringing ethical and social problems before their students for thought and study; many seminaries have added to their curriculum special courses in Christian ethics, sociology, or both. On the other hand, the growing closeness of the relations between civilized, and the uncivilized and heathen nations, has brought the question of missions and missionary training prominently before the church and the seminaries; and a number of institutions have begun special courses for the study of the history of missions and the methods of missionary work; while some few have recently undertaken the comparative study of religions. Another recent departure in the educational policy of the theological seminaries is the introduction of the elective system; some of the more advanced theologians contend that the work should be largely or entirely elective; but the general policy is to require study of the fundamental branches and to limit the electives to a few courses such as are demanded by special tastes or by special lines of work. Other questions which have for some time confronted the theological schools are, "Shall Greek and Hebrew be required of all students?" and "Shall college graduation be required for admission?" While it is generally admitted and the best general education and a thorough knowledge of the original languages of the Bible is of great advantage to the minister, still it is undoubtedly true that many men unable to obtain collegiate education or linguistic training, are intellectually and spiritually fitted for the ministry; and it seems unreasonable and unjust to wholly deny to such men the advantage of some seminary training. The general policy of the seminaries is either to provide a full English course for which Hebrew and Greek are not necessary; or to admit to special courses such students as have not had and do not desire training in these languages; or sometimes to provide courses in beginner's Greek for those who have not had college training. College graduation is not required for entrance to the seminary, as a rule; but a college training or its equivalent is frequently required for the obtaining of the bachelor of divinity degree. On the whole it may be said that the tendency is to raise the requirements for the professional degree, and to make it represent full professional training, without at the same time denying to those unable to obtain the full course, the privileges and inspiration of seminary training.

Theology, the science of religion. This term, together with the corresponding personal term, antedates the Christian era, having been used by classic writers both Greek and Roman. In the view of Aristotle, Cicero, and others the man who appeared to be specially conversant with the divine nature was fitly called a theologian. Among those honored with this name were Pherecydes of Syros and Epimenides of Crete.

Definition and Scope.— In the modern use of the term a narrower and a broader signification may be distinguished. The former, paying special respect to the etymology of the word, includes in theology simply discourse about God. It was in this restricted sense that the word was employed by the classic writers, and a corresponding usage had place in the first Christian age, when, for example, the evangelist John, on the ground of his relatively full reference to the divinity of the Christ, was called "the theologian." It was understood that the subject matter of theology pertains to such transcendent themes as the Logos and the Trinity. In the broader signification theology includes not only discourse about God, but also an exposition of whatever in man's nature seems to bring him into distinct relation with God; likewise an exposition of whatever in man's experience and destiny may be regarded as founded on this relation. In this sense it is the theoretical counterpart of religion, and corresponds very well to the following description by Gladstone: "Theology is ordered knowledge, representing in the region of the intellect what religion represents in the heart and life of man." While

resort is still occasionally made to the restricted sense, as when, for instance, theology is put in antithesis with anthropology, the broader signification is far more commonly the one intended in current usage. It is evidently, therefore, the signification which should give the standard for the present discussion.

In a precise determination of the scope of theology a question will arise, in the first place, as to the measure of consideration which it is appropriate to bestow upon the ethnic religions. Manifestly, if theology is the theoretical counterpart of religion, it will not do to neglect so large an area of religious facts as is included in the ethnic systems. A secure and well-rounded theory of religion must take account of all accessible religious facts, whether inside or outside of the pale of historical Christianity. At the same time it is to be noticed that the central tenets of Christianity, as they appear in the sacred oracles and have generally been held, unmistakably presume upon the preeminence and finality of the Christian religion. Anyone therefore who regards himself as scientifically obligated to accept these tenets, on the score of a clear preponderance of evidence in their behalf, will of necessity be convinced that he fulfils the demands of a scientific theology in taking subordinate account of the ethnic systems, that is, so far as respects formal recognition of them within his own theological structure. It is not needful, indeed, that he should deal with these systems in a tone of radical disparagement. As a matter of fact, the industrious research which for the last quarter of a century or more has been bestowed upon the great ethnic religions, such as Zoroastrianism, Buddhism, Brahmanism, and Confucianism, has served distinctly to enlarge appreciation for their contents. At the same time, the farther this research has proceeded the more indubitable has it made the proof that Christianity has no occasion to look to any outside religious province for an appreciable supplement to its teachings. The conclusion follows that the Christian theologian deals normally with the ethnic systems when he simply accords to them a place in branches auxiliary to some of the main divisions of theology. In so far as they have modified Christian history they make matter for a branch auxiliary to historical theology. In so far as they supply data for a philosophy of religion they help to constitute a branch auxiliary to systematic theology.

A second important question, under the theme of scope or province, concerns the relation of theology to philosophy. That the one is under practical compulsion to enter the domain of the other is apparent upon both rational and historical grounds. Their tasks are closely related. Philosophy may be defined as an attempt to get at ultimate truth by rational processes. Theology attempts, within limits, the same thing. It undertakes to get at ultimate truth in so far as that truth has religious worth or significance. Theology may enter upon its task with a more positive presumption in favor of written revelation than that which belongs to the philosophical starting-point. Still, if it is to maintain a scientific character, it cannot take that presumption as a mere matter of course. On the contrary, it must treat the same as a subject for searching inspection. Now this inspection will naturally lead sooner or later to the great problem of the conditions of rational certainty. Thus the initial task of theology in approving or rating the authority of sacred oracles conducts into a province of philosophical inquiry. And what occurs at this point is repeated at various other points. The development of the deeper themes of theology involves in general a use of philosophical premises, either metaphysical, psychological, or ethical. A veto against such use is impotent. A Tertullian may exclaim, "What has Athens to do with Jersualem? What concord is there between the Academy and the Church?" But before the echo of his voice has died away he will be likely to get onto the ground of Athens, and to be borrowing from the Academy or some kindred source. From beginning to end Christian history testifies to the tendency of theological construction to utilize philosophical points of view. Among the early Fathers the more speculative were manifestly influenced by the Platonic philosophy. A little later the Neo-Platonic philosophy became an appreciable factor in theological thinking, and through the writings of the pseudo-Dionysius was introduced to the thinkers of the mediæval period. At the crowning period of mediæval scholasticism Aristotelianism was decidedly in the ascendant, insomuch that Aristotle was often cited under the simple designation of "the philosopher." In the modern period the Cartesian philosophy, the Leibnitz-Wolffian, the Lockian, the Kantian, the Hegelian, and others have unmistakably claimed spheres of influence in the theological domain. It appears, therefore, that a discreet choice of philosophical affiliations is the best that theology can do. It may enter into too close an alliance with a specific philosophy. It may fail to observe the due balance between a speculative bent and a sane regard for historical data. But it will and must draw largely from the resources of philosophy if it is to be fundamental and comprehensive.

A further question on the scope of theology concerns the relation of this branch to the domain of natural science. That a relation obtains, to which a measure of significance may be attached, is undeniable. It is not to be overlooked, however, that the field of natural science comes into less extensive contact with theology than does the field of philosophy. In so far as science moves in a physical or sub-human range, it touches upon matters that are of only subordinate theological import. It may enforce a revision of the theory of creation which has been read into or elicited from the biblical narrative; but of how small theological consequence is a conclusion on the precise method of creation, so long as God in his absolute supremacy and man in his dignity and worth are left to the contemplation! It may enlarge the view of the operation of secondary causes in the production of organic forms, and so may require some modification of the putting of the argument from design: but that involves no challenge to any theological tenet or interest, since the vast range of orderly results in nature must still be seen, as many of the most eminent naturalists confess, to demand ultimately an ordering intelligence. In short a close scrutiny of the subject will reveal that the findings of the physical sciences can neither displace the foundations of the central tenets of theology nor supply foundations to those tenets. Their function is exhausted in

modifying one and another peripheral matter or adjunct of the theological system. Probably the greatest result which has come from that quarter is an offspring of the doctrine of evolution, and consists in an enlarged tendency of the theological mind to expect, in relation to the kingdom of God in the world, tokens of the law of consecution and graduated progress. Undoubtedly the theologian does well to take note of the approved findings of natural science; but large expectations of contributions from that quarter are not likely to be fulfilled. It is in the constitution and experiences of man, and in the philosophical interpretation of both the world of nature and of personality, that theology must find its principal basis. Among the human experiences that come into the account those which make up the substance of sacred history may of course claim a distinct primacy. In other words, the Bible may be rated as the foremost treasury of theological data.

Scientific Value and Rank.— One and another system of theology, as actually developed, may be remote from a scientific character. But intrinsically scientific construction is just as feasible and appropriate in the field of theology as in any other field. Where a contrary impression has obtained it has generally been due to one of three causes. Either the agnostic maxim that religion has the unknown for its proper field has been adopted, and in consequence theology, as the theoretical side of religion, has been pictured as devoid of substantial foundation; or theology has been associated with arbitrary authority; or a strained antithesis between reason and faith has been contemplated.

As respects the maxim which embodies the first of these grounds of objection, it must be pronounced a gratuitous negation of religion. It is a negation of religion, for sheer mystery offers no means of attachment. In the words of Pfleiderer, "a religion of nothing but mystery is an absurdity." The maxim is also perfectly gratuitous. As John Fiske has said: "None can deny that religion is the largest and most ubiquitous fact connected with the existence of mankind upon earth." Is so vast a department of human experience to be regarded as utterly incompetent to supply any valid grounds of induction? Are the concurring thoughts, aspirations, and satisfactions of the elect spirits of the race to be rated as void of all rational suggestions? Is no sure basis of conviction to be found in the illuminated and transcendent consciousness of the Christ? Such questions need no formal reply. Theology doubtless has a great border-land of mystery. And so has biology. Indeed it is characteristic of most of the sciences that they impinge upon mystery. Alongside a domain of certainty they include areas which can claim at best only a high degree of probability. On the score of mystery, therefore, no good reason is apparent for expelling theology from scientific fellowship.

The second ground of objection to the scientific character of theology is sufficiently met by the affirmation that arbitrary authority is an interloper in the theological domain. If it has ever installed itself there, it has been in the exercise of rank usurpation. Theology in its true character has no partnership with arbitrary authority. While it may make large account of positive revelation, it does not turn that revelation into a fence against investigation but uses its content for what it proves itself to be under the tests of mental scrutiny and prolonged application to the exigencies of man's deeper life.

To the third objection a reply of similar tenor is to be made. The assumption of an antagonism between reason and faith, and of an obligation to sacrifice the former to the latter, is an assumption which a sane theology must emphatically repudiate. It is very true, doubtless, that reason cannot take the place of faith, any more than theory can take the place of action. But it is equally true that faith cannot endure to be in known antagonism to reason. An assent which, from the standpoint of the one rendering the same, does not appear to be sanctioned by reason, is no real assent. Only that which is competent to take captive man's rational personality is able to induce a faith that is anything more than a sham or a shadow. Quite as much as any other branch of learning theology is free to emphasize the demand for rationality in faith. The challenge to its scientific character is thus seen to fail as respects each of the cardinal objections mentioned.

In an unbiased valuation of theology too rigid an association will not be made between substance and form. Integrity of substance is compatible with a variety of forms. Theology in no wise rebels against a poetic garb. Far as are the picturesque discourses of Jesus from the scholastic form, they are deeply based in theology. Filling all their background is one of the most pronounced conceptions of God, as well as the most beautiful that was ever set before the contemplation of men. All religious discourse which is to avoid the charge of emptiness and impotency must in like manner enclose a substantial theological content. As Phillips Brooks has said, "No exhortation to a good life, that does not put behind it some truth as deep as eternity, can seize and hold the conscience."

Even in its formal character theology may be rated as second in interest to no department of thought and study. The facts and truths with which it more directly deals are the deepest in man's being and the highest above the human plane. It utilizes the most significant findings of a large proportion of the branches of learning. It takes into consideration the greatest treasures of past history, and gathers up the data for the farthest possible outlook into future destiny. It gives ample room for speculative acumen, but at the same time includes the themes that are of all the most intensely practical.

The Organic Arrangement of Subject-matter. — The best arrangement of the several divisions and branches of theology is obviously the one which is characterized by simplicity as well as by comprehensiveness and self-consistency. The very subtle scheme is likely to please its inventor in a much higher degree than the theological world at large. Among plans of arrangement which meet in good measure the combined demands of simplicity and comprehensiveness those of Heinrici and Hagenbach are worthy of special mention. The former draws a distinction between "historical" and "normative" branches, the one being made to include the specifically biblical branches as well as the history of Christianity since biblical times, and the other comprising, as principal subdivisions, Systematic Theology and Practical Theology. The

idea of the historical branches is to exhibit the whole deposit of religious truth and fact; the idea of the normative branches is to afford means of guidance in religious teaching and work. That there is a certain fitness in the distinction between the two lines of study is undeniable. Still the distinction is not beyond criticism. One who accre iits a high degree of authority to the Bible may well be reluctant to exclude the designation of "normative" from one and another biblical branch. Especially may he hesitate to exclude that designation from Biblical Dogmatics. In view of this ground of exception to Heinrici's nomenclature the plan of Hagenbach — which divides the whole theological domain between Exegetical, Historical, Systematic, and Practical Theology — may be regarded as having at least an equal claim to appreciation. Aside from its intrinsic merits, a motive for giving this plan the preferred place in the present connection is found in the fact that it is very largely reflected in the curricula of theological institutions.

Each of the divisions in the fourfold scheme of Hagenbach contains a somewhat indeterminate number of specific branches. A measurably complete list for Exegetical Theology may be given as follows: (1) Biblical Philology or Linguistics, which treats not only of the biblical languages, but also of languages so far cognate with the biblical as to be able to furnish means of understanding the peculiarities of the latter. (2) Biblical Archæology or the science of Biblical Antiquities. (3) Canonics, or the branch which gives the history of the canon, or collection of sacred books, and also the principles which enter into the determination of the proper compass of that collection. (4) Biblical Criticism, which in one division is textual, and in another literary and historical. The former seeks to ascertain the true or original text; the latter is occupied with the investigation of the biblical books for the purpose of ascertaining their authorship, their date, their relation to other writings, canonical or uncanonical, the degree of their historical trustworthiness, and the special stage which any one of them may represent in the development of the biblical religion. The two forms of criticism are frequently distinguished as the Lower and the Higher. (5) Biblical Introduction, in which the fruits of criticism are utilized for a more or less detailed characterization of each of the two Testaments and also of the individual books which they contain. (6) Hermeneutics, or the science of biblical interpretation. (7) Exegesis, or the presentation in detail of the results of an examination into the meaning of biblical texts.

Historical Theology includes in its biblical part the following divisions: (1) Old Testament History; (2) the Life of Christ; (3) the History of the Apostolic Age; (4) Biblical Theology of the Old Testament; (5) Biblical Theology of the New Testament. Etymologically considered Biblical Theology might denote other than a historical branch, being taken as the equivalent of Biblical Dogmatics. But as actually treated it is a historical discipline, its object being to set forth the genesis of doctrine and its movement through the various stages which may be discerned in the Old and the New Testament respectively. In its post-biblical part Historical Theology falls into two main divisions, General Church History, and the History of Christian Doctrine. The former admits of a great number of subdivisions, it being possible to award a monographic treatment to such themes as missions, polity, discipline, worship, and art. In its earlier section General Church History includes in particular Patristics and Christian Archæology, of which the former gives an account of the lives and writings of the fathers (usually of the first six centuries), and the latter furnishes a systematic presentation of monumental and documentary evidence on the art, institutions, rites, customs, and characteristic modes of thought and feeling in the early Christian community. To the History of Doctrine the most important subsidiary branch is Symbolics, or that which treats of the creeds. As an auxiliary branch the History of Philosophy takes the first rank.

Systematic Theology, which has, in its Christian character, the office of furnishing an orderly presentation and justification of the whole body of teachings or beliefs which belong to the Christian religion, includes three principal branches, namely, Apologetics, Christian Dogmatics, and Christian Ethics. It may also include Biblical Dogmatics, Polemics, and Irenics, though the subject-matter covered by these titles can conveniently be appropriated within other branches. An auxiliary to Systematic Theology of special significance is found in the Philosophy of Religion. Of the several branches named Christian Dogmatics is so far central and prominent as often to be styled Systematic Theology. Being free to gather its evidence from every field, and aiming to present in organic form the whole doctrinal content of the true religion, it commands in the field of theology the maximum intellectual interest.

In Practical Theology the leading branches are Liturgics, Homiletics, and Pastoral Theology. The last named is of wide compass, including besides the general theme of pastoral care such subsidiary branches as Catechetics, Ecclesiastical Polity, Ecclesiastical Discipline, and Theory of Missionary Work. Recently the interest in sociological study has created a motive to subjoin a branch which might be entitled Christian Sociology.

Prominent Stages and Representatives.— In the broad view three great epochs in the progress of theology are distinguishable, namely, the Greek, the Latin, and the Modern. The last might also be called with relative propriety the Protestant, since the motive-power for its developments has been supplied in large part from within the domain which bears that title. The development of the Latin type was in part contemporary with the shaping and manifestation of the Greek type; still the former appears clearly second in order, since its initial stages were synchronous with the culminating stages of the latter. Greek theology had run its course and come essentially to a standstill before the more characteristic systems of Latin theology were elaborated by the mediæval scholastics. The two undoubtedly had very much in common. The same great creeds were acknowledged in the Latin as obtained in the Greek division of Christendom, and the dogmatic grounds which were alleged ultimately for the severance of fellowship were of subordinate import. Still Greek theology stood in measurable contrast with Latin.

It took on the whole a more genial view of the divine relation to the non-Christian world. It was less inclined to a sombre conception of man's native guilt and moral impotency. It accentuated to a special degree the thought of a divine incarnation and of the intimate connection between God and man provided for by means of the incarnation. The same thought was by no means foreign to Latin theology, but in its domain it was given, relatively speaking, less prominence, since it was made to share the field with the greatly emphasized conception of divine rulership. The standpoint of the one affiliated with a mystical theory of an interior life; the standpoint of the other was more legal and governmental. Both admitted the ideas of priestly mediation and sacramental efficacy, at least after the initial stage; but it accorded with the genius of Latin theology to work out the most consummate expression of these ideas in a thoroughly elaborated hierarchical and sacramental system. In the one authority came to be regarded as specially resident in the creeds and formularies of the past, in the other great prominence came to be assigned to the hierarchy, and especially to its head, as the perpetual embodiment of infallible authority. While this line of contrasts may legitimately be affirmed, it is to be understood that one and another point of difference cannot be taken too strictly, since in neither the Latin nor the Greek domain was theological thinking entirely uniform or homogeneous.

The Protestant era was initiated in a revision of the principle of authority which had been transmitted in Latin Christianity; and a fundamental feature of the theological activity of that era has consisted in carrying out this revision to its logical results. Original Protestantism accepted in common with the Latin communion the great outlines of doctrine contained in the ancient creeds, especially the Nicene and the Chalcedonian. But it accepted them upon a revised basis. What was that basis? In the last analysis it must be defined as the principle of free rational induction, in opposition to the principle of judicial determination by official authority. The primary appeal was indeed to the scriptural content and to the doctrine of justification by faith. But since no infallible tribunal was set over the Scriptures, the appeal thereto amounted practically to a transference of the main emphasis to the free rational process. As respects the doctrine of justification by faith, it looked evidently in the same direction, since it profoundly qualified the necessity of priestly mediation or of dependence upon the hierarchy. The assertion of this revised conception of authority, it is needless to say, was not designed to imply any challenge to the idea of supernatural revelation. Logically, too, the Protestant principle involves no necessity to challenge that idea. What it shuts out is official monopoly of revelation and authoritative determination of its import by official prerogative. In place of this it installs, as the proper ground of theological convictions, free rational induction, an induction which, to be properly carried out, must take full account of the data of history, reason, and experience. The advocates of the Protestant principle admit the great difficulty of the task of ideal theological construction on the basis of that principle; but it is their conviction that exemption from the labor of a thoroughgoing induction ought not to be sought in the religious sphere any more than in other spheres. The seeking of relief in the attachment of infallible authority to some perpetual office in the Church they regard as quite useless and mistaken, since it is less difficult to accredit, on the basis of history, reason, and experience, any worthy element of belief, than it is to prove the continuous existence of an infallible tribunal.

In a closer review of the progress of theology it would be necessary to notice a number of significant developments in each of the great epochs mentioned. Account would need to be taken of the peculiarities of the early Alexandrian, the Cappadocian, the later Alexandrian, and the Antiochian schools in the Greek Church. In relation to the Latin Church attention would need to be given to the long history of the antithesis between Augustinian and anti-Augustinian tendencies; to the struggle between Jansenism and Jesuitism; to the conflict between Gallicanism and Ultramontanism. Within the Protestant domain there would be occasion to consider the early creative period of the Lutheran theology; the scholastic period in the 17th century; the Pietistic and Rationalistic movements in Germany; the implication of Lutheran theology with successive philosophies since the dawn of the 18th century; the controversies between Calvinism and Arminianism; the contrasts between High Church, Low Church, and Broad Church parties in the Anglican Establishment; the wide-reaching tendencies born of the Wesleyan revival; the initiation in Germany of the great movement of biblical criticism and its extension to other countries; and the rise and influence of the Ritschlian theology.

Among theological writers eminent for their representative position, or breadth of influence, or both, we may specify, in the Greek Church, Origen, Athanasius, Basil, Gregory Nazianzen, Gregory of Nyssa, Cyril of Alexandria, Theodoret, and John of Damascus; in the Latin or Roman Church, Augustine, Anselm, Peter Lombard, Alexander Hales, Albertus Magnus, Thomas Aquinas, Bonaventura, Duns Scotus, Suarez, Bellarmin, Petavius, and Perrone; in the Lutheran Church, Luther, Melanchthon, Chemnitz, Gerhard, and Schleiermacher; in the Reformed Church on the Continent, Zwingli, Calvin, Bullinger, Turretin, and Arminius; in England and her dependencies, Hooker, Chillingworth, Pearson, Bull, Baxter, Owen, Howe, Butler, Wesley, and Edwards.

Bibliography.— Briggs, 'General Introduction to the Study of Holy Scripture'; Cave, 'Introduction to Theology'; Crooks and Hurst, 'Theological Encyclopædia and Methodology'; Heinrici, 'Theologische Encyclopädie'; Rabiger, 'Encyclopædia of Theology'; Schaff, 'Theological Propædeutic'; Allen, 'The Continuity of Christian Thought'; Fisher, 'History of Christian Doctrine'; Hagenbach, 'Manual of Doctrinal History'; Harnack, 'History of Dogma'; Loofs, 'Symbolik'; Schaff, 'Creeds of Christendom'; Sheldon, 'History of Christian Doctrine'; Dillmann, 'Handbuch der alttestamentlichen Theologie'; Oehler, 'Theology of the Old Testament'; Schultz, 'Old Testament Theology'; Adeney, 'Theology of the New Testament'; Beyschlag, 'New Testament Theology'; Holtzmann, 'Lehrbuch der neutestamentlichen Theologie'; Stevens, 'Theology of the New Testa-

ment'; Weiss, 'Biblical Theology of the New Testament'; Bovon, 'Dogmatique Chrétienne'; Clarke, 'Outline of Christian Theology'; Dorner, 'System of Christian Doctrine'; Heinrich, 'Lehrbuch der katholischen Dogmatik'; Hodge, 'Systematic Theology'; Kaftan, 'Dogmatik'; Martensen, 'Christian Dogmatics'; Maurice, 'Theological Essays'; Miley, 'Systematic Theology'; Nitzsch, 'Lehrbuch der evangelischen Dogmatik'; Pope, 'Compendium of Christian Theology'; Ritschl, 'The Doctrine of Justification and Reconciliation'; Shedd, 'Dogmatic Theology'; Sheldon, 'System of Christian Doctrine'; Smith, 'System of Christian Theology'; Stearns, 'Present-Day Theology'; Strong, 'Systematic Theology'; Van Oosterzee, 'Christian Dogmatics.'

HENRY C. SHELDON,
Professor of Systematic Theology, Boston University.

Theophylact, thē-ŏf'ĭ-lakt (surnamed SIMOCATTA), Byzantine historian: b. Locri, Italy, about 570; d. there about 629. He was of Egyptian descent and went to Constantinople in 610, where he was employed in various public offices under Heraclius until his death. Of his extant works the most important is 'Historiæ Mauricii Tiberii Imperatoris Libri VIII.,' edited with Latin translation (1604), and by Bekker, in 1834. This work gives in eight books a detailed account of the wars of the Emperor Mauricius (582–602). Of his other works there remain 85 letters, and 'Quæstiones Physicæ,' edited by J. F. Boissonade (1835).

The'orem. See GEOMETRY.

Theoret'ical Mechanics. See MECHANICS.

Theory of Assemblages. See ASSEMBLAGES, GENERAL THEORY OF.

Theory of Curves. See CURVES OF DOUBLE CURVATURE.

Theory of Equations. See EQUATIONS, GENERAL THEORY OF.

Theory of Functions Variable. See COMPLEX VARIABLE, GENERAL THEORY OF FUNCTIONS OF.

Theory of Groups. See GROUPS, THEORY OF.

Theory of Numbers. See NUMBERS, THEORY OF.

Theory of Probability. See PROBABILITY, THEORY OF.

Theory of Surface. See SURFACE, THEORY OF.

Theosophy, as its Greek derivatives signify, means Divine Wisdom — wisdom concerning God. It is that general system of thought which has appeared in all ages shaping itself in one form and another and which has attempted to explain the nature of God, the universe and man's relation thereto. Among the Orientals it is conspicuous in the philosophic systems of China, India, and Egypt. It is seen in the works of the Gnostics, the Neo-Platonists, and the Cabalists, and in the speculations of Böhme, Schelling, Eckhart and in the teachings of Kapila and Shankaracharya, Pythagoras and Plato, Valentinus and Plotinus, Simon Magus and Apollonius of Tyana, Paracelsus and Bruno. It represents a body of tradition which has been preserved from earliest times and is not only found in the philosophic and speculative writings of those above mentioned and many others, but has been taught from time to time by sundry religious and mystical orders,— in the far East by the Gurus and Initiates, and in Greece by the various schools of the mysteries. During the Middle Ages traces of the teaching are to be found in Masonry and Mediæval Mysticism, and later in the Order of Rosicrucians, and it has at all times comprised the esoteric side of the great religions of the world.

The Theosophical Society.—In modern times this Wisdom-tradition was revived by a Russian named Helena Petrovna Blavatsky (q.v.) who, on 17 Nov. 1875, aided by Col. Henry Steel Olcott (q.v.) of New York, founded in that city the Theosophical Society, and modern theosophical thought owes its origin and propaganda to the writings and efforts of herself and her colleagues in this society. The objects of the society as originally declared were to collect a library and diffuse information concerning secret laws of nature. Later these objects were remodeled, and as now framed are:

1. To form a nucleus of the universal brotherhood of humanity, without distinction of race, creed, sex, caste, or color.

2. To encourage the study of comparative religion, philosophy, and science; and

3. To investigate the unexplained laws of nature and the powers latent in man.

«Assent to or sympathy with the first of these objects is required for membership, the remaining two being optional and intended to subserve the first. The society has no dogmas or creed, is entirely non-sectarian, and includes in its membership adherents of all faiths and of none, exacting only from each member the tolerance for the beliefs of others that he would wish them to exhibit towards his own. Their bond of union is not the profession of a common belief, but a common search and aspiration for truth. They hold that truth should be sought by study, by reflection, by purity of life, by devotion to high ideals, and they regard it as a prize to be striven for, not as a dogma to be imposed by authority. They consider that belief should be the result of individual study or intuition, and not its antecedent, and should rest on knowledge, not on assertion. They extend tolerance to all, even to the intolerant, not as a privilege they bestow, but as a duty they perform, and they seek to remove ignorance, not to punish it. They see every religion as an expression of the Divine Wisdom, and prefer its study to its condemnation, and its practice to proselytism. Peace is their watchword as truth is their aim.» "There is no religion higher than Truth" is the motto of the society. The general headquarters of the society are at Adyar, Madras, India, the residence of Colonel Olcott, its president-founder.

Its Aims.—It is stated that in the foundation of the Theosophical Society and in the writing of her various works, Madame Blavatsky was directed and aided by certain Eastern adepts or sages, whose pupil she had been for many years and that the purpose of the movement was to stem the tide of materialism and agnosticism, which then threatened to engulf the thought of the age, and to stimulate transcendental research. Doubtless the fullest and the most authoritative statement of the ends which the modern theosophical movement were intended to accom-

plish is to be found in the following letter written by one of those adepts to one of his Western pupils:

"You can do immense good by helping to give the Western nations a secure basis upon which to reconstruct their crumbling faith. And what they need is the evidence that Asiatic psychology alone supplies. Give this and you will confer happiness of mind on thousands. . . . This is the moment to guide the recurrent impulse which must soon come, and which will push the age toward extreme atheism, or drag it back to extreme sacerdotalism, if it is not lead to the primitive soul-satisfying philosophy of the Aryans. . . . You and your colleagues may help to furnish the materials for a needed universal religious philosophy; one impregnable to scientific assault, because itself the finality of absolute science; and a religion that is indeed worthy of the name since it includes the relations of man physical to man psychical, and of the two to all that is above and below them. . . . Its (the society's) chief aim is to extirpate current superstitions and skepticism, and from long-sealed ancient fountains to draw the proof that man may shape his own future destiny, and know for a certainty that he can live hereafter." Since then a considerable literature has sprung up within the society which, it is believed, has to no slight extent influenced the thought of the closing decades of the 19th century and made possible the almost popular interest in the unseen world. Among the leaders of theosophical thought since the death of Madame Blavatsky, are Mrs. Annie Besant (q.v.), Mr. C. W. Leadbeater, Mr. A. P. Sinnett, and Mr. G. R. S. Mead,—Mrs. Besant being Madame Blavatsky's successor in the esoteric as well as in the exoteric work of the society. Through the writings of these theosophists the so-called theosophical theories, which for centuries have seemed vague and speculative, besides being greatly amplified, have been presented in a form more definite than at any other time in the history of such thought, the teachings now no longer resting upon tradition and intuition, if indeed they ever did wholly so, but largely upon investigations made into the supra-physical realms of nature by highly developed men whose trained powers enable them to respond sympathetically to vibrations of a finer order than those which the normal man is able to sense, and to come thus into conscious relations with subtler regions of nature within and extending vastly beyond the physical world. .The training whereby these powers are gained is begun in the esoteric department of the Theosophical Society and falls more especially under its third object, which deals with the unexplained laws of nature and the powers latent in man.

Fundamental Principles.—Among the facts asserted by some theosophical writers as being known to themselves and capable of verification by those who are willing to make the necessary sacrifices to gain the required powers are: (a) the existence of a few highly evolved men, called Adepts or Masters — not solely of any one nation, but of any of the advanced nations — who have gained these divine powers in their fullness; that they exist now as in the past; that they are substantially omniscient so far as the laws and conditions of our own solar system extend, and that their high stage of progress entitles them to advancement beyond human conditions, but that they of their own free will have chosen to remain in touch with humanity in physical incarnation, that they may aid in its evolution; that it is from the Brotherhood of these great Adepts that from time to time have come into the outer world the great world teachers and that in their keeping has been the Wisdom-tradition, which in every age they have caused to be expressed in suitable form; that there have always been pupils of these men, and that theosophical teaching is published to the world to-day at their instigation and through a few of their pupils; (b) the existence of a very subtle order of matter, far finer than the ether which transmits light, upon which is impressed photographically, so to speak, in the form of living pictures, every scene or happening, however great or small, which has ever occurred from the very beginning of things and throughout the extent of the universe; that to this subtle material has been given the name of the Akâshic Records, or the Memory of Nature; that not only does the trained observer who has acquired the power of sensing these conditions of the subtler medium of the universe, or of responding sympathetically to its vibrations, *see* vividly the particular occurrence to which he turns his attention, but he *hears* and *feels*, etc., just as did the actors in any particular event which may be under review, perceiving their thoughts and feelings as well as seeing and hearing the outward conditions of the scene; that thus he can accurately, in proportion to his powers of observation, perceive any occurrence of the past, no matter when it may have happened, and in this way can know the true events of history; that he may also direct his vision to any period in the life of a planet and trace out its various evolutionary processes, and that he may thus enter a limitless field of observation wherein he may learn at first hand of the obscurer laws of nature; (c) that by the exercise of their highly evolved powers the Adepts or Masters of Wisdom can make definite experimental research into the Akâshic Records in quite as real a sense as the physicist makes his investigations within the physical world, and that they are, with these and other powers possessed by them, enabled to ascertain and teach certain general principles as definite facts, all of which are now and have ever been known to them, and very many of said facts have to a more or less extent, been proven by the investigations of those of their pupils who have fitted themselves to do such work. In 'The Secret Doctrine' Madame Blavatsky mentions three such principles as being the fundamentals of theosophy; they are:

1. An Omnipresent, Eternal, Boundless, and Immutable Principle, on which all speculation is impossible, since it transcends the power of human conception and can only be dwarfed by any human expression or similitude. It is beyond the range and reach of thought — unthinkable and unspeakable.

2. The Eternity of the Universe *in toto* as a boundless plane; periodically "the playground of numberless universes incessantly manifesting and disappearing" called "the manifesting stars," and the "sparks of Eternity."

3. The fundamental identity of all souls with the Universal Over-Soul, the latter being itself an aspect of the Unknown Root; and the obligatory pilgrimage for every soul — a spark of the former — through the cycle of incarnation, or necessity, in accordance with cyclic and Karmic law, during the whole term.

Cosmogenesis.—According to the theosophist all manifestation has its origin in the Absolute, of whom naught can be said save that "He is." As Mrs. Besant eloquently describes it in 'The Ancient Wisdom,' "Coming forth from the depths of the One Existence, from the One beyond all thought and all speech, a Logos, by imposing on himself a limit circumscribing voluntarily the range of His own Being, becomes the Manifested God, and tracing the limiting sphere of His activity, thus outlines the area of His Universe. Within that sphere the Universe is born, is evolved and dies; it lives, it moves, it has its being in Him; its matter is His emanation; its forces and energies are currents of His life; He is immanent in every atom; all-pervading; all-sustaining, all-evolving; He is its source and its end, its cause and its object, its centre and circumference; it is built on Him as its sure foundation, it breathes in Him as its encircling space; He is in everything and everything in Him. Thus have the sages of the Ancient Wisdom taught us of the beginning of the manifested worlds. From the same source we learn of the self-unfolding of the Logos into a threefold form; the First Logos, the Root of all Being; from Him the second, manifesting the two aspects of life and form, the primal duality, making the two poles of nature between which the web of the universe is to be woven — Life-Form, Spirit-Matter, Positive-Negative, Active-Receptive, Father-Mother of the worlds. Then the Third Logos, the Universal Mind, that in which all archetypically exists, the source of beings, the fount of fashioning energies, the treasure-house in which are stored up all the archetypal forms which are to be brought forth and elaborated in lower kinds of matter during the evolution of the universe. These are the fruits of past universes, brought over as seeds for the present." From the Third Logos comes forth the seven Great Logoi, sometimes called the Seven Spirits before the throne of God; and as the divine outbreathing pours itself ever further outward and downward, from each of these we have upon the next plane Seven Logoi also, together making up on that plane forty-nine. Omitting the detail of intermediate hierarchies, it is said that to each of these forty-nine Logoi belong millions of solar systems, each energized and controlled by its own solar Logos. Thus the difference is vast between the Great Logoi, the Trinity standing next to the Absolute, and the Logos of a single solar system, though the latter is far greater and more sublime than mankind has ever yet conceived the Deity to be. It is said that what happens at the beginning of a solar system (such as our own), is, allowing for certain obvious differences in the surrounding conditions, identical with what happens at the reawakening after one of the great periods of cosmic rest. Before a solar system comes into existence we have on its future site, so to speak, nothing but the ordinary conditions of interstellar space, that is, the seven subdivisions of the lowest cosmic or universal plane. These, from the viewpoint within our system, are identical with the matter of the highest, or the atomic subplanes of each of our planes. Upon this matter is poured out the energy of the third aspect of the Logos of the system, called the Third Logos, resulting in the quickening of the vitality which pervades all matter, so that when electrified by it the atoms of the various planes develop all sorts of previously latent attractions and repulsions, and enter into combinations of all kinds, thus by degrees bringing into existence all the lower subplanes of each plane, that is, the six planes below the atomic subplane, until we have before us in full action the marvelous complexity of the seven planes of nature and their respective seven subdivisions as they exist to-day. These planes represent both the physical and the unseen parts of the system, the former being its most densified phase and each plane of the latter being made up of matter of a gradually ascending scale of fineness. These planes are called respectively, (1) the physical plane, (2) the astral plane, (3) the mental plane, (4) the buddhic plane, (5) the nirvanic plane, (6) the paranirvanic plane, and (7) the mahaparanirvanic plane, each being a definite region of the system, and their various subdivisions appearing in a general way, the same as the subdivisions of the matter of the physical plane, namely, as solids, liquids, gases, and four states of ether. The matter of the subtler planes, however, is permeable, one order freely interpenetrating another and all extending both within and without the physical. The properties of each plane are also said to have an additional dimension to the one next preceding it in density. Thus the physical plane having three, the astral has four, the mental five, and so on. As stated, the highest or seventh subdivision of each plane is the atomic matter of that plane, that is, is homogeneous and cannot be further subdivided without undergoing an entire change of properties. Thus in breaking up the ultimate physical atom, it assumes the properties of the matter of the complex lowest subplane of the astral plane; in breaking up the astral atom it becomes of the lowest grade of matter of the mental plane, and so on. After the matter of all the subplanes of the system is by the action of the Third Logos formed and vivified, there is poured out upon it the energy of the second aspect of the Logos of the system, called the Second Logos, and is sometimes known as the monadic essence. The effect of this outpouring is to build the forms of the seven kingdoms of nature — the three elemental or pre-mineral, the mineral, the vegetable, the animal and the human. On the downward arc of its mighty curve this monadic essence simply aggregates round itself the different kinds of matter of the various planes, so that all may be accustomed and adapted to act as its vehicles; but when it has reached the lowest point of its *involution* or immeshing in matter and turns to begin the grand upward sweep of *evolution* towards divinity, its object is to develop consciousness in each of these grades of matter in turn, beginning with the physical — the lowest. When in the highest animal life this monadic essence or evolving

soul mass, reaches the ultimate limit of evolution in that type of forms, it is met by a third outpouring of Logic energy, that of the first aspect of the Logos of the system, called the First Logos, resulting by this union in the formation of the numberless human Egos — the individualization of the One Self in man. It is the presence within man of this third outpouring of the Divine Life, this spark of the One Self, that guarantees to him immortality, which, from this point on, the Ego, or real man, wins through innumerable incarnations in physical bodies.

Anthropogenesis.—As the worlds are septenary in their constitution, so also is man. He has on the physical plane (1) *a physical body*, the dense or visible portion of which is composed of solids, liquids, and gases, and the etheric portion thereof is formed of the four subdivisions of ether. Pervading these is (2) *vitality*, derived from the sun and specialized by the etheric part. On the astral plane he has (3) *an astral or desire body*. And on the lower four levels of the mental plane he has (4) *a mind body*. These four principles constitute the personality, or what is often called the lower quaternary. On the three upper levels of the mental plane he has (5) *a causal or higher mental body*, the storehouse of all his experiences, past, present, and future; on the buddhic plane, (6) *a buddhic or bliss body*, wherein the inherent unity of all life is directly perceived, not as an intellectual concept, but as a sublime experience, and on the nirvanic plane he has (7) *a nirvanic or Atmic body*, the body of absolute reality. These last three constitute the Reincarnating Ego, the individuality, the soul which lives and grows throughout the period of solar manifestation. The other two planes may be termed the planes of the Self, or pure spirit. The matter of the various planes of nature entering into the composition of man's sundry bodies is vivified with the involving life of the monadic essence, the law of whose progress is to sink deeper and deeper into matter, while the law of the evolution of the Self using these bodies as vehicles of his consciousness is upward and out of matter. This apparent opposition of forces in man gives rise to the usual ideas concerning his lower and higher natures, and explains the meaning of evil. One's desires, thoughts, and emotions are not himself, but the changing phantasmagoria of the living essence of his lesser vehicles which it is his business to learn to control and purify, until they become perfect instruments for his use,— for the real man within is none other than the changeless, eternal Self.

When the human Egos began their long pilgrimage of incarnations they at first took bodies on planets other than the one on which we now live. There are in our solar system seven planetary schemes of evolution, each the realm of a planetary Logos, and they are called, in the order of their distance from the sun, (1) the Neptune scheme, (2) the Uranus scheme, (3) the Saturn scheme, (4) the Jupiter scheme, (5) the Earth scheme, (6) the Venus scheme, and (7) the Vulcan scheme. Each scheme consists of a chain of seven planets and each proceeds on independent lines, there being no intermingling of their activities during their normal course. The first and fifth of this series have each three physical planets, the others one each. The two physical planets of the first scheme besides Neptune are as yet unseen by the telescope. The two of the fifth, in addition to our earth, are Mars and Mercury. The non-physical planets in the schemes are of the matter of the astral and mental planes. Each scheme of evolution is worked out by means of seven Manvantaras or periods of manifestation, each Manvantara consisting of seven Rounds, each round consisting of seven World Periods (following each other on seven planets in succession) and each world period consisting of seven Root Race Periods, any one of the latter covering periods of millions of years. The present humanity on this planet has passed four times around the planets of its chain, and through a fraction over four root race periods. The last planet occupied by us during the present round was Mars and the next will be Mercury. The two root races next before the present fifth root race of this planet were the Atlantean and the Lemurian races. The fifth root race has thus far developed as far as its fifth sub-race and it is stated that the beginnings of a new sub-race, the sixth, may be found to-day in America.

Reincarnation and Karma.—Omitting all mention of the interesting career of the reincarnating egos through the primigenous conditions of the first three rounds of our own planetary chain and even of the first four root races of this present fourth round, it will suffice to show that among the undeveloped sub-races of the present fifth root race, reincarnation takes place within a brief period after the death of the body; that after each death there is a stay of more or less duration on the astral plane followed quickly by another physical incarnation. Later on as the life experiences bring greater growth to the incarnating soul, when he has developed some of the finer emotions, his stay in the invisible world is prolonged by an additional period in a specially protected and blissful region of the mental plane called "devachan," the heaven world. Here his stay is proportional to the degree of his nobler earth experiences, usually lasting, for the average man of substantial attainments who has lived to a good age, about fifteen centuries. Upon the ending of this devachanic life there remains only the reincarnating ego, the lower bodies constituting the personality having disintegrated on their respective planes; but the principles or qualities animating them have meanwhile left their impress upon the ego. In sending forth his next personality the action of the ego is colored and limited by the stamp upon it of these characteristics developed by the previous personality, so that the new personality begins his life cycle at the highest stage of growth reached by the previous one. This process of reincarnation goes on in "the three worlds" for vast periods of time, not on one planet alone, but on many, as the human life-wave passes from one to another — from one whose life processes have begun to wane to another more fitted to be the field of higher human possibilities, until at length the end is attained for which all manifestation seems to have been caused — the perfect growth of the soul, the

unfoldment of all his potential divinity. The ethical law which governs the conditions of our lives, physical and supra-physical, is called Karma, and it is ineradicably operative in Reincarnation. It may be defined as the law of action and result. By virtue of the operation of this law, effects which cannot be ascribed to any immediate cause, may be traced to causes existing in other incarnations of the same ego, thus establishing one's ultimate, personal responsibility for whatever may befall him. Furthermore, owing to this law, one may and does at each moment of his present life, produce by his own actions, feelings and thoughts definite effects in the subtler order of things, resulting in conditions for his next earth life wholly of his own making.

> Thoughts build character,
> Desires make opportunities,
> Actions make environments.

So that whatever one may suffer or enjoy, attain to or fall from, is brought about as the result of his own action, in obedience to this law of absolute justice. It is the alternate experience of pleasure and pain which man encounters during his stages of ignorance that develops within him wisdom; and the opportunities guaranteed to him for the accomplishment of this end through Reincarnation and Karma are well nigh limitless. These two doctrines are perhaps the most far-reaching of all the theosophic teaching, as they seem to clear up a host of perplexing questions and establish the basis for a satisfying philosophy.

Propaganda.—Among the results of theosophic propaganda is the restoration to the Western world of the said doctrines of Reincarnation and Karma, and the elimination of the many perversions of them existing in the East. Another is the occult proof produced of the definite, objective reality and potency of thoughts and emotions, showing that these forces are as to their respective planes as visible and real as physical objects are on the physical plane, and that every thought is a living, active entity, persisting for a length of time proportional to the strength that is put into its creation and wields a greater or less influence on those with whom it may come into touch. (See Mr. Leadbeater's 'Man Visible and Invisible,' illustrated, and Mrs. Besant's 'Thought Forms,' illustrated). Still another is the order which it has brought out of the chaos of the apparently unrelated data of metaphysics, mysticism and the neo-psychology, including the facts of clairvoyance, clairaudience, mesmerism, hypnotism, telepathy, astrology, apparitions, psychometry, and the like. And still another is the establishment by irresistible evidence of the basic unity of all the great world religions and their fundamental relation to an unprejudiced and open-minded science. To help the religions to clear away their non-essential accretions, to sink into insignificance doctrinal differences, to bring to the fore their points of unity, to study their doctrines and traditions in the spirit of brotherliness, and to help each from his own particular standpoint is one of the chief ends to which the theosophist bends his efforts. He does not seek to found a religion, but to expound those we already have, and so give them a deeper meaning and a richer life. While the theosophist limits himself to no particular form of creed, yet, the following three truths may be said approximately to include the broad scope of his belief.

1. God exists, and He is good. He is the great lifegiver who dwells within us and without us, is undying and eternally beneficent. He is not heard, nor seen, nor touched, yet is perceived by the man who desires perception.

2. Man is immortal, and his future is one whose glory and splendor have no limit.

3. A Divine law of absolute justice rules the world, so that each man is in truth his own judge, the dispenser of glory or gloom to himself, the decreer of his life, his reward, his punishment.

Occultism.—Unless he finds the religion to which he happens to be connected insufficient to meet the demands of his higher nature, the theosophist is apt to seek through the esoteric side of his philosophy, the gateway of Occultism, in order that he may prepare himself for a more serious religious life. Occultism, as distinguished from the Occult Arts, or Magic, is that system of endeavor which, teaching the methods whereby the personality, or lesser, or more human side of man may be made to expand and embrace his higher or divine nature, leads its votaries along a difficult and narrow pathway of rigid virtue and mental and emotional control, and so requires a firm moral foundation upon which to build the extraordinary powers pertaining to the unseen world. The true Occultist possesses unselfishness, justice, and true knowledge; he has compassion and wisdom; his desire nature is purified and his habit of mental concentration fixed; "the contents of his consciousness are something more than his five-sense perceptions *plus* the deductions he draws from them by his reason, and such vague ideas and intuitions as he may possess."

Through Occultism the aspirant, wearying of the phenomenal world, seeks to outstrip his fellows in evolution and within a few strenuous incarnations to accomplish what the mass of humanity in the normal course will only attain to in long reaches of time, namely, the highest adeptship, or liberation from the "wheel of rebirth." In doing so he treads a path, which according to occult teaching, has three great divisions:

1. The probationary period, before any definite pledges are taken, or initiations (in the full sense of the word) are given. This carries a man to the level necessary to pass successfully through what in theosophical books is usually called the critical period of the fifth round.

2. The period of pledged discipleship, or the path proper, whose four stages are often spoken of in Oriental books as the four paths of holiness. At the end of this the pupil obtains adeptship — the level which humanity should reach at the close of the seventh round.

3. What may be called the official period, in which the adept takes a definite part (under the great Cosmic Law) in the government of the world, and holds special office connected therewith, but none of the details of this period can be made known.

The probationary path has five stages but

the divisions between its stages are less decidedly marked than those of the higher groups, and perfection is not required in anything during this period, only a serious effort toward it. In the *first* stage the candidate for adeptship acquires a firm intellectual conviction of the impermanence of mere earthly aims; in the *second* a perfect indifference to the fruits of his own action; in the *third* (a) perfect control of mind, (b) of conduct, (c) a generous tolerance, (d) endurance, (e) one-pointedness, (f) confidence in his Master and himself; in the *fourth* an intense desire for union with the highest; and in the *fifth* he gathers up and strengthens his previous acquisitions for the next great step, which will set his feet upon the path proper as an accepted pupil. During his life on the probationary path the pupil will have received much teaching from his Master, usually imparted during the sleep of his physical body, while he himself is clad in his astral body in full consciousness on the astral plane. He will also have been taught while thus functioning in the astral world to bring help, instruction and comfort to the inhabitants of that world, who having laid aside their physical bodies at the gateway of death have passed beyond the physical plane. This phase of occult work is sometimes called that of the *Invisible Helpers* and is performed, be it understood, by men still having physical bodies and who have developed this power of functioning consciously outside the same on inner planes. The pupil will further have been trained in meditation, and this effective practice both in waking consciousness and outside the physical body during its sleep will have quickened and brought into active exercise many of the higher powers.

When the pupil has developed the fifth qualification of the probationary path he is ready for initiation upon the path proper, henceforth to serve his Master, whom he now meets face to face, in helping forward the evolution of the race, his life, "to be offered up on the altar of humanity, a glad sacrifice of all he is, to be used for the common good." This path consists of four distinct stages and the entrance to each is guarded by an initiation. Ere the second initiation can be passed the pupil must lose the sense that the separated, personal self is a reality, and must feel himself one with all; he must destroy doubt and superstition by knowledge; ere he passes the third he must bring into full working order the inner faculties, those belonging to the subtler bodies; now he needs to incarnate but once again; ere the fourth is passed he rids himself of desire and aversion and sees the One Self in all. At this stage he needs to return no more. The fourth initiation admits him to the last stage of the path where he throws off all clinging to life in form and all longing for even formless life. Then he casts off the "I-making" faculty — pride, irritability, and ignorance, and henceforth dwells on the plane of unity. The man is then perfect, is free, the liberated one. He has won Nirvana. "He has completed man's ascent, he touches the limit of humanity; above him there stretches hosts of Mighty Beings, but they are superhuman; the crucifixion in flesh is over, the hour of liberation has struck, and the triumphant "It is Finished" rings from the conqueror's lips, . . . he has vanished into light nirvanic." But being now Master of Compassion as well as Master of Wisdom, he returns from that light to earth, henceforth to devote himself to the service of humanity with mightier forces at his command than he wielded while he trod the path of discipleship, bending all his sublime powers to the quickening of the evolution of the world. Such an one was the Buddha — such the Christ, and such the few Great Souls who tread the earth to-day, secluded from its external strife, yet pouring down upon mankind from the great heights of their sublime advancement inestimable blessings, guiding by means of their divine powers whole races and nations, but unknown to all but the few earnest souls who come to them through the ancient gateway of Occultism, the portal of which has throughout all time stood ajar for the resolute pilgrim.

Before the cycle of time shall close and all manifestation cease, the greater portion of mankind will have reached this high stage of growth. And then shall all be gathered unto Him for the great Cosmic rest only, after æons and æons of time, to emerge again with Him, to be the Architects and Builders of future universes. Such are a few of the teachings of the Ancient Wisdom, given forth at this time as Theosophy and Occultism.

Bibliography.—H. P. Blavatsky, 'Isis Unveiled'; 'The Key to Theosophy'; 'The Voice of the Silence'; 'First Steps in Occultism'; 'The Secret Doctrine'; Annie Besant, 'The Ancient Wisdom'; 'The Seven Principles of Man'; 'Reincarnation'; 'Karma'; 'Death and After'; 'Man and His Bodies'; 'The Building of the Kosmos'; 'The Self and Its Sheaths'; 'Evolution of Life and Form'; 'The Birth and Evolution of the Soul'; 'A Study in Consciousness'; 'Four Great Religions'; 'The Religious Problem in India'; 'Thought Power: Its Control and Culture'; 'Theosophy and the New Psychology'; 'Esoteric Christianity'; 'Avataras'; 'In the Outer Court'; 'The Path of Discipleship'; 'Ancient Ideals in Modern Life'; 'Bhagavad Gita' (trans.); A. P. Sinnett, 'Esoteric Buddhism'; 'Growth of the Soul'; 'Occult World'; G. R. S. Mead, 'Fragments of a Faith Forgotten'; 'Orpheus'; 'Pistis Sofia'; 'Simon Magus'; C. W. Leadbeater, 'An Outline of Theosophy'; 'The Astral Plane'; 'The Devachanic Plane'; 'Clairvoyance'; 'Invisible Helpers'; 'Dreams'; 'Man Visible and Invisible' (illustrated); 'The Christian Creed'; 'The Other Side of Death'; 'Some Glimpses of Occultism'; Mabel Collins, 'Light on the Path'; W. Scott-Eliott, 'Story of Atlantis'; William Williamson, 'The Great Law'; H. S. Olcott, 'Theosophy, Religion and Occult Science'; 'Old Diary Leaves,' Vols. I., II., III.; Mrs. Cooper-Oakley, 'Traces of a Hidden Tradition,' etc.; C. H. Hinton, 'The Fourth Dimension'; Lillian Edgar, 'Elements of Theosophy.'

The materials for the above sketch have been drawn more or less literally from the aforementioned works.

A. P. Warrington,
Fellow of the Theosophical Society.

Theotokos, a title given to the Virgin Mary by a decree of the third ecumenical council, which met at Ephesus 431 to condemn the Nes-

torian heresy. The term means "bringing forth God," and is intended to formulate the fact implied in the annunciation of the angel to Mary "that holy thing which shall be born of thee shall be called the son of God." Theotokos (Latin, *Deipara*), implies that the child of Mary was of divine nature from the moment of his conception; that he was not born mere man, to whom, as Nestorius taught, the divine nature was subsequently imparted.

Thera, thā'ra or thē'ra, an island in the Ægean Sea, belonging to the Grecian archipelago, the most southerly of the Cyclades. It is of volcanic formation, and presents many interesting phases. New islands are formed from time to time by its volcanic action, notably the last in 1866. Scientists have given the island considerable attention and many observations have been made, and records kept. The soil is very fertile.

Theramenes, thĕ-răm'ĕ-nēz, Athenian politician of the 5th century B.C. He first became prominent in 411 as a member of the Council of 400, but perceiving the inevitable downfall of that government, he joined the opposing party and assisted in its overthrow. In 410 B.C. he was in command of a portion of the Athenian fleet, with which he cruised about and exacted tribute from the neighboring islands, and later he joined the fleet under Thrasybulus, with whom he took part in the battle of Cyzicus. He subsequently served with Alcibiades, participated in the siege of Chalcedon in 408 B.C., and in the capture of Byzantium. After the battle of Arginusæ in 406 he repaired to Athens, and in order to exculpate himself for not saving the crews of the ships accused his colleagues of neglect, and through his testimony they were sentenced to death. In 404 B.C., when Athens was besieged by the Spartan general Lysander, Theramenes was sent as an envoy to negotiate terms with Sparta. He purposely remained on his mission for three months, during which time Athens was reduced to dire extremity and was forced to make peace upon such terms as to place her at the mercy of the Lacedæmonians. He was elected one of the Thirty Tyrants (q.v.) after the peace, and at first heartily supported the measures of the government. The violent measures of Critias and his colleagues, however, induced him to form an opposing party, which rapidly increased in strength. He was accused by Critias of being a public enemy, dragged to prison, and forced to drink the hemlock.

Therapeutæ, thĕr-a-pū'tē, a Jewish sect of devotees of the 1st century after Christ. They withdrew into solitary places, where they devoted themselves to a life of religious contemplation, and to them with the Essenes the origin of monasticism in the Christian Church has been traced.

Therapeutics, that branch of medicine which deals with the treatment of disease. Nature cures; physicians treat. This is an old dogma as true to-day as it was when uttered over 2,000 years ago by a famous Greek physician. Scientists have termed that power of the human body the *vis medicatrix naturæ*, by means of which nature tends to right her own disordered organs, and it is important to recognize this all-important function of the body, and not to interfere by overzealousness in the use of potent agents with nature's own slowly acquired powers of self-restoration. An innocuous and half-hearted therapy, however, is not the logical system, even if such reconstructive powers of nature are granted. The modern conception of disease does not admit of ready characterization. In the articles on disease and pathology (q.v.) it is attempted to define what is meant by disease, but such definitions are far from being satisfactory because of the immense variety of diseased conditions, their manifold causation, and their devious progressions. In all disease certain groups of physiological functions are altered, and in the attempt to aid nature to bring these disturbed physiological activities to a normal condition the chief work of the therapeutist lies. It makes little or no difference what the agencies may be that are used — often, as has been said, none are necessary — yet the ideal of the therapeutic art is to restore to normal condition, as far and as quickly as possible, the disturbed bodily functions. While it is true that the physician of to-day employs many of the agents used by physicians thousands of years ago, there is a far greater precision and a much more comprehensive series of ideas concerned in their use by the well-equipped modern therapeutist than was possible to his early predecessors. The one aim of the physician throughout the centuries has been the alleviation of suffering and the restoration of the diseased to health or to comfort; and notwithstanding the many small cliques and divergences of opinion, the progress toward scientific therapeutics has been steady and increasingly satisfactory. At the outset of this summary of therapeutics it may be well to consider for a moment the different classes of agents at hand by the use of which, singly or combined, the physiological functions of the body may be modified, and thus be made useful in the healing art.

Expressed categorically, the different therapeutic agents or systems are: (1) Suggestiontherapy; (2) Dietotherapy; (3) Physicotherapy; (4) Mechanotherapy; (5) Pharmacotherapy; (6) Surgicotherapy. Each of these will be briefly discussed.

Unquestionably the oldest and yet youngest therapeutic agent is suggestion. The power to heal by faith is not the special property of any sect or class, nor the exclusive right of any system. Belief in gods and goddesses, prayer to idols of wood, of stone, of gossamer fiction, faith in the doctor, belief in ourselves engendered from within or from without — these are all expressions of the great therapeutic value for healing that resides in the influence of mental states on bodily functions. These will not move mountains; they cannot cure consumption; they do not influence a broken leg, nor an organic paralysis; but suggestion, in its various forms, may be and is one of the strongest aids to all therapeutic measures. Of its abuse by designing hypnotists, blackmailers, clairvoyants, and a motley crew of parasites, space does not permit particularization. The human mind is credulous — it believes what it wants or wills to believe; and the use of suggestion in therapeutics is one of great power for good and for evil.

The treatment of disease by diet constitutes another large branch of the therapeutic art.

Modern chemistry has resolved all foods and drinks into their elements, and has given the physician valuable aids in the treatment of a large number of diseases. Many obscure disorders, such as diabetes, gout, myxœdema, obesity, etc., are closely allied with certain defects in the metabolism of certain physiological systems of the body. Many of these are best treated by a dietary regimen, combined, it may be, with other means. Many of the minor disorders of the digestive tract (see DIGESTION) are best treated by regulation of the diet.

By physicotherapy is meant the use of certain physical agents such as heat, cold, light, electricity, etc. Certain forms of application of the agents are termed (a) hydrotherapy (q.v.), in which heat and cold are applied by means of water; (b) phototherapy (q.v.), in which light is used in the treatment of disease. Sunlight, electric light, ultra-violet rays (Finsen's light), X-rays, radio-active substances — these all exert on the tissues of the body certain influences that, properly applied, may bring about restoration of disordered functions, and thus aid nature in curing disease.

Mechanotherapy is the use of mechanical movements in treatment. Massage, vibration, gymnastics, Swedish movements (see SWEDISH MOVEMENT CURE), etc., are some of the different forms in use. Under the name of osteopathy (q.v.) it is attempted to elevate one of the oldest aids to treatment, in use by the Greeks, Chinese, etc., to the rank of an exclusive system. Osteopathy is mechanotherapy carried to an extreme.

Under the terms pharmacotherapy and surgicotherapy are included the treatment of disease by drugs, so-called, and by surgical means. So far as treatment by means of drugs is concerned, it is interesting to note that practically all drugs act on the tissues of the body in some chemical or physicochemical manner. They may have a certain selective action on certain tissues of the body. Thus the large group of the alcohols, comprising ethers, aldehydes, chloroform, hypnotics — such as trional, sulphonal, veronal, urethane, and a large number of others — have a selective action on the nervous tissues of the brain, benumbing their activities and causing drunkenness, or anæsthesia, or sleep, according to the dose or other conditions. Others act on sensory nerves, diminishing pain; such are cocaine, opium, antipyrine, acetanilid, phenacetine, cannabis, etc. Again, other remedies act chiefly on the intestines, giving the large group of cathartics; and so the entire list of drugs might be analyzed. Given a knowledge of the selective or generalized action of the drugs, the power that they may exert in correcting abnormal physiological activities is solely a matter of application, and in accordance with the correct interpretation of the cause of the disturbed functions will the therapeutic application be of direct value or not. In other words, drugs are nothing more than chemical agents which may be used to modify certain physiological activities; if by their well-known power in modifying these activities other morbid activities may be corrected, they are agents for good. (For a consideration of surgicotherapy, see SURGERY.)

One other phase of therapeutics remains to be considered. It has been pointed out that nature has resources of her own for overcoming certain types of disease. Can these natural powers be so played upon or affected as to increase their operation? Along this line new paths have been opened up since the recognition of a large class of diseases known as infectious. Bacteriology (q.v.) has taught that disease organisms (bacteria) cause the disturbance (disease) in the body not so much by their physical presence as by the extremely virulent poisons that they form. It is the struggle of the human body to get rid both of bacteria and poisons that makes the disturbance which is called the disease. Thus the diarrhœa of typhoid is one of nature's efforts to throw off poisons; the high temperature and crisis of pneumonia (q.v.) is a supreme effort of the body, which sometimes succumbs under it, to deal a death-blow to the pneumococcus, the micro-organism that causes the disease. The high temperature in malaria (q.v.) unquestionably kills off a great many of the parasites in the blood.

But in addition to these larger and more palpable efforts on the part of nature to overcome the invader, a series of subtle and intricate defenses are at work in the blood-serum, some of the elements of which are known. Thus in some diseases there is elaborated in the blood-serum a direct chemical antidote, an antitoxin, to the poisons of the invading bacteria. Such a protective power is found in diphtheria (q.v.). (See ANTITOXINS.) Vaccination, the discovery of which was almost the result of an accident, is a form of serum-treatment. (See SERUM-THERAPY.) The details of the reasons why immunity is conferred by the modified smallpox of the cow are not yet known, as the true cause of smallpox is not indubitably proven, but the time is not far off when the different factors herein involved will be unearthed. A large number of other questions are concerned in this great question of natural and acquired immunity (q.v.).

Human progress has been likened to the advance of a drunken man, and it is certain that the ups and downs, and side-lurches, and backward steps in the path of therapeutics have been many; but withal there has been a broad blaze of progress. That which has been tried and been found to be true, has been grasped and has become the heritage of the whole community. The physician class have shared with the people at large in the general movements; there have been many side-tracks from the broad road of therapeutics; innumerable *pathies* have had their little day or their 100 years; each in its turn has contributed what kernel of truth it possessed to the progress of the mass.

Consult: Bernheim, 'Suggestive Therapeutics — Dietetics'; Hutchinson-Thompson, 'Physicotherapy, Mechanotherapy'; Cohen, 'System of Physiologic Therapeutics — Pharmacotherapy'; Brunton, 'The Action of Medicines'; Cushny, 'Pharmacology and Therapeutics'; Schmiedeberg, 'Arzneimittellehre'; 'Surgery'; Mikulicz-Bruns, edited by W. T. Bull, 'Immunity'; Roger, 'Infectious Diseases'; Ehrlich, 'Seitenkettetheorie'; Vaughan and Novy, 'Cellular Toxins.'

SMITH ELY JELLIFFE,
Professor of Pharmacognosy, Columbia University; Instructor in Therapeutics, Columbia University.

There'sa, Saint. See TERESA, SAINT.

Theresiopel, tĕr-ā'zē-ō-pĕl, or **Maria-Theresiopel,** mä rē'ä-tĕr-ā'zē-ō-pĕl, Hungary, a royal free town in the county of Bács-Bodrog, 25 miles southwest of Szegedin, in a broad plain between the Danube and the Theiss. The buildings worthy of notice are the churches of Saint Theresa, church of the Franciscans, a beautiful Greek church, town-house, etc., theatre, barracks, gymnasium, and music-school. The industrial works include tanneries, linen and leather manufactories, and dyeworks. Wheat, tobacco, wine, and fruits are grown and cattle-raising is important. There is a brisk trade in horses, cattle, sheep, hides, and wool. There is a fashionable watering-place in the vicinity. Pop. (1900) 82,122.

The'riac, or **Theri'aca,** a compound said to have been first prepared by Andromachus of Crete, who was physician to the emperor Nero. It was supposed to be an antidote to poison, and continued in use throughout the Middle Ages. As prepared in Venice and other places it was a compound of 64 drugs, pulverized and reduced by means of honey to an electuary.

The"riodon'tia, an order of the *Theromorpha* (q.v.), containing a group of early genera of large carnivorous reptiles, in which, among other strong characteristics, the teeth are differentiated into incisors, canines, and molars. They must have been ferocious beasts of prey.

Thermæ, thĕr'mē (from the Greek *thermai,* signifying originally warm or hot springs), properly warm baths, but also applied generally to the baths of the ancients. During the Roman Empire the buildings for this purpose were constructed with great splendor, and adorned with paintings, statuary, libraries, gymnasium, and public walks. The baths of Nero, Titus, Caracalla, and Diocletian at Rome were distinguished for the magnificence and luxury displayed in their construction. See BATH AND BATHING.

Thermic Fever. See SUNSTROKE.

Thermidor, thĕr-mĭ-dôr' (Fr. tĕr-mē-dôr), the 11th month of the year in the calendar of the first French republic. It commenced on 19 July, and ended on 17 August. See CALENDAR.

Ther'mit, a name given by Goldschmitt to a mixture of fine aluminium filings or powder and iron oxide. When this mixture is ignited by some suitable means the aluminium unites vigorously with the oxygen of the iron oxide, forming a very pure variety of steel and a slag consisting mostly of aluminium oxide. This union of finely divided aluminium with oxygen gives use to a very intense heat, 3,000° C. Besides the ordinary thermit (iron oxide and aluminium filings) other mixtures may be prepared from aluminium and the oxides of nickel, cobalt, chromium, manganese, etc. When these are ignited in a properly prepared crucible violent reaction takes place, the oxygen of the oxide being taken up by the aluminium, leaving a very pure metal, nickel, cobalt, etc. This process is now much used to get metals from those oxides that heretofore have resisted all ordinary methods of reduction. When ordinary thermit is ignited the temperature produced is so high that the iron and the slag are left in a molten and highly heated condition. If this iron is allowed to flow on to another piece of iron or steel it will heat it enough to soften it and the whole will harden to a homogeneous mass. In this way it can be used to replace broken parts of machinery, to mend broken or cracked propeller shafts, to weld together railroad rails so as to form one continuous rail, etc. Some of the important features in this process are its cheapness, ease of execution, and the fact that machinery, etc., can be repaired in position. The method is to surround the part to be repaired with an ordinary mold box; a magnesia-lined crucible with a plug in the bottom is placed over the opening; the thermit is placed in the crucible, ignited, and as soon as the violent reaction has subsided the plug is pulled and the white hot metal allowed to flow into the mold. Iron tubes can be welded together by placing the ends in a mold and allowing the thermit product to flow in in such a way that the liquid slag first comes in contact with the tubes. The slag forms a protective covering which prevents the hot iron from uniting with them, though it does allow the tube ends to become hot enough to unite as one piece.

Ther'mo Barom'eter. See THERMOMETER.

Thermo-Chemistry, or **Thermal Chemistry,** that branch of physical chemistry which deals with the thermal changes which occur when chemical reactions take place, or when a body or a system (such as a solution) undergoes certain kinds of physical change. Its precise limits are not easy to define, since the subject merges into ordinary chemistry on the one hand, and into thermodynamics on the other. Any chemical operation can be considered from two points of view, according as we are interested in the modification that it produces in the nature of the substances that are involved, or in the quantity of energy which is absorbed, liberated, or otherwise transformed at the same time. It is the province of thermo-chemistry to investigate the transformations of energy that occur in such cases. The complete discussion of the energy-transformations that accompany a given chemical change should include the consideration of every type or form of energy which may be present; but the investigations which have hitherto been made have related chiefly to the quantities of heat which are liberated or absorbed, and it is to this circumstance that the science owes its present name, "thermo-chemistry."

The quantity of heat that is liberated or absorbed during a proposed chemical reaction can be determined by causing the given reaction to take place in the interior of a calorimeter. The particular form of calorimeter that is to be used will naturally depend to a considerable extent upon the nature of the reaction that is to be studied. If the problem consists in the determination of the quantity of heat that is liberated when two given liquids are mixed, the calorimeter commonly consists of a platinum vessel, capable of containing from 500 to 1,000 cubic centimetres, placed inside of another vessel of silver; the space between the two vessels being filled with water. The liquids that are to be examined are brought to the same temperature as nearly as possible, and are then mixed in the platinum vessel. The rise of temperature of the calorimeter being noted, and the masses and specific heats of the various parts of the calorimeter (and its contents) being determined by separate experiments, we are then in position

to calculate the quantity of heat energy liberated by the reaction. For detailed information with regard to the various kinds of calorimeters that are used, and for a discussion of the sources of error to which such instruments are liable, reference must be made to extended works upon heat and thermo-chemistry. (See the references at the end of this article.)

In thermo-chemical work, the unit of mass is almost invariably the gram; and the gram is always understood, when no other unit is specifically mentioned. The unit of heat is also understood to be the calorie, which, for thermo-chemical purposes, is defined as the quantity of heat required to raise the temperature of one gram of water by one centigrade degree, when the temperature of the water is in the vicinity of 18° or 20° C. The notation that is employed in expressing the results of a thermo-chemical experiment upon the heat that is developed by a given chemical reaction is simple. The formulæ of the substances that react are written within square brackets, and separated by a comma or a colon; it being understood that the number of grams that are present of any one substance is equal to the molecular weight of that substance. A sign of equality is written after the bracketed formulæ, and on the right hand side of this sign the number of calories of heat generated or absorbed by the reaction is written; a positive sign being affixed (or suffixed) when heat is evolved, and a negative sign when it is absorbed. The indices that are attached to the symbols of the various elements are written *above* those symbols, instead of below. For example,

$$[H^2,O] = +68{,}360$$

signifies that when two grams of hydrogen and 16 grams of oxygen, both at about 18° C. and under ordinary atmospheric pressure, combine to produce 18 grams of water (also at 18° C.), the quantity of heat that is evolved is sufficient to raise the temperature of 68,360 grams of water by one centigrade degree; the temperature of the water being about 18° C. When a compound is broken up into its constituent parts, the bracketed formulæ are preceded by a negative sign. Thus the expression

$$-[H,Cl] = -22{,}000$$

signifies that when, by any means, 36.5 grams of hydrochloric acid are decomposed so as to set free 1 gram of hydrogen and 35.5 grams of chlorine, the change is accompanied by the absorption of a quantity of heat that would be sufficient to raise the temperature of 22,000 grams of water by 1° C.

The "heat of formation" of a substance is the quantity of heat given out when the substance is formed from its constituents; it being taken as negative when the formation of the substance is accompanied by the absorption of heat. In general, any given substance may be prepared in various ways, from different materials or constituents; and in such cases the heat of formation will be different, according to the particular substances that are regarded as constituents. For example, sulphuric acid might be prepared from sulphur, oxygen and water, according to the equation

$$S + 3O + H_2O = H_2SO_4,$$

or from sulphur dioxid, oxygen and water, according to the formula

$$SO_2 + O + H_2O = H_2SO_4,$$

or from sulphur trioxid and water, according to the equation

$$SO_3 + H_2O = H_2SO_4;$$

and the heat formation will be different in these several cases, if we regard the immediate materials from which the acid is prepared as the "constituents" of the acid. But if the acid is prepared from the elements sulphur, hydrogen and oxygen (all three being taken in certain standard initial physical states in each instance), then the heat of formation will be sensibly the same, whether these elements combine directly to form the acid, or whether the oxids of sulphur and hydrogen are first produced, and these subsequently combine to form the acid. In fact, the principle of the conservation of energy (see Energy) shows that when a body or a system of bodies passes through a succession of changes, either physical or chemical in nature, so as to pass from one given initial state to another given final state, the total change in the internal energy of the body or system is identically the same, whatever the nature of the transformations may be, by which the change is effected. Hence it follows that whenever the heat that is emitted or absorbed in the course of a reaction represents nothing but the decrease or increase in the internal energy of the system, the total quantity of heat that is emitted or absorbed will be entirely independent of the way in which the transformation takes place. If, however, the system performs external mechanical work in passing from its initial state to its final state, the heat energy that is actually given off will be less than that corresponding to the change in the internal energy by the amount which is expended in performing the external work. In many of the reactions that are considered in thermo-chemistry, the external work that is performed is too small to be of any material significance, and in these cases the heat energy that is emitted or absorbed in the passage from one state to another may be logically regarded as independent of the kind of transformation that the transition involves. In some cases, however, and particularly when the systems under consideration are partly or wholly gaseous, the external work that is performed is great enough to require serious consideration, and in order to obtain accurate results, this work must be estimated and allowed for.

The application of the principle of the conservation of energy to the determination of the heat of formation of a substance, when that heat cannot be directly observed, may be illustrated by the case of phosphorus. We have, when ordinary phosphorus is burned to the pentoxid,

$$[P^2,O^5] = +369{,}100;$$

which signifies that when 62 grams of ordinary phosphorus (the atomic weight of that element being 31) are burned to pentoxid, 369,100 calories of heat are emitted. A similar experiment with amorphous phosphorus gives the corresponding relation

$$[P^2,O^5] = +326{,}800.$$

Evidently the internal energy of the amorphous variety is less than that of the ordinary variety, since when both are converted into the same thing, the amorphous phosphorus gives out sensibly less heat. The difference of the foregoing numbers is 42,300; and dividing this by 2 (since the foregoing numbers apply to 62 grams of the phosphorus), we reach the final conclusion that when 31 grams of ordinary phosphorus

are converted into the same mass of amorphous phosphorus, the conversion is attended by the emission of 21,150 calories of heat. Similar experiments have been performed in great number upon compounds that are isomeric with one another; and yet the data that are available do not warrant any but the broadest generalizations. It appears, for example, that the internal energy of a compound that admits of isomeric modifications depends (1) upon the symmetry of structure of the molecule, (2) upon the natures of the atoms which are directly joined in the molecule, and (3) upon whether or not each molecule in the compound exhibits its maximum valency toward the molecules of other kinds with which it may be associated. Thomsen endeavored to discover, by thermo-chemical methods, whether a single bond between two adjacent carbon atoms is stronger or weaker than a double or triple bond. His methods and conclusions are perhaps not absolutely beyond criticism, but he was led to believe, from his experiments, that a triple bond between two adjacent carbon atoms constitutes a much weaker connection than either the single or the double bond.

The methods of thermo-chemistry have been applied extensively to the investigation of problems in the theory of solutions, to the study of the affinity between acids and bases, and to the elucidation of many of the difficult points of physical chemistry. These applications, however, assume a knowledge not only of experimental and theoretical physics and chemistry, but also, and more particularly, a sound understanding of thermodynamics.

Consult: Muir and Wilson, 'Elements of Thermal Chemistry'; Thomsen, 'Thermochemische Untersuchungen'; Naumann, 'Thermochemie'; Planck, 'Grundriss der allgemeinen Thermochemie.'

A. D. Risteen, Ph.D.,
Editorial Staff, 'Encyclopedia Americana.'

Ther"mo-dynam'ic Engine, a name applied to any form of steam-engine and gas-engine.

Ther"modynam'ics, or The Mechanical Theory of Heat, that branch of physical science which treats of the relation of heat energy to energy of other kinds, and particularly of the convertibility of heat energy into mechanical energy, and the converse. In order to discuss, quantitatively, the conversion of one kind of energy into another kind, we must first have a definite method of measuring each of them. Mechanical energy (see Energy) is measured by determining the amount of work that a given quantity of it can perform; the customary unit employed for this purpose being the "foot pound" or the "metre-kilogram" in engineering practice, and the "erg" in scientific work; the "erg" being defined as the quantity of work done in overcoming a resistance of one dyne, through a distance of one centimetre. The unit employed in the measurement of heat is almost universally the quantity of heat required to raise the temperature of some definite mass of water through one degree, on some stated part of the thermometric scale. The ordinary "British thermal unit," which is used in engineering practice in English-speaking countries, is the quantity of heat required to raise the temperature of one pound of water by one Fahrenheit degree; and in countries that use the metric system, the engineering unit is the quantity of heat required to raise the temperature of one kilogram of water through one centigrade degree. As the specific heat (q.v.) of water varies slightly at different temperatures, these definitions are not absolutely definite, unless the part of the thermometric scale at which the experiment is to be performed is specified. Unfortunately there is no general agreement among engineers on this point; and for most purposes in practical engineering, it is customary to ignore the slight variation in the specific heat of water, and to consider the foregoing definitions to be sufficiently precise as they stand. For scientific purposes, where the greatest possible accuracy is required, this course is not permissible, and it becomes necessary to specify the particular degree through which the temperature of the water is to be raised. Even here there is no definitely established convention; but there appears to be a growing tendency to adopt the degree that extends from 14.5° C. to 15.5° C. In scientific work, too, it is customary to define the thermal unit in terms of a gram of water, instead of a kilogram; and the scientific heat unit (which is called the "small calorie," to distinguish it from the "greater calorie" that is used in engineering), may be defined as the quantity of heat required to raise the temperature of one gram of water from 14.5° C. to 15.5° C.

The science of thermodynamics is founded upon two general, fundamental laws, which, so far as we are aware, are absolutely rigorous, and which are respectively known as the "first" and "second" laws. These we shall consider in order.

The "first law of thermodynamics" is nothing but a special application of the general principle of the conservation of energy. (See Energy.) It states that whenever heat energy is converted into mechanical energy (or the reverse), then for each unit of one kind of energy that disappears, there is always a perfectly definite and constant quantity of energy of the other kind which appears. Mayer and Joule discovered this fact independently, about the year 1840. There has been, in the past, some considerable controversy as to the credit that should be assigned to these respective investigators. We cannot enter into this discussion, but the reader who desires to follow it up will find an admirable and very fair statement of the facts of the case in two papers on the Copley medalists of 1870 and 1871, in Tyndall's 'Fragments of Science.' Joule did a vast amount of experimental work for the purpose of determining the exact value of the "mechanical equivalent of heat," as the constant is called, which expresses the number of units of mechanical energy that are equivalent to one unit of heat; and in the course of his labors he tried many different experimental methods. (See 'The Scientific Papers of James Prescott Joule.') His best known method consisted in stirring a known mass of water, and measuring the rise in temperature so produced, as well as the quantity of mechanical work expended in the stirring. He thus ascertained that the temperature of one pound of water is raised by one Fahrenheit degree, by the expenditure of 772 foot-pounds of mechanical energy. This constant, which is known as "Joule's equivalent" and is

denoted by the symbol *J*, has played an all-important part in engineering and scientific work for more than half a century. A better value of it was obtained by Rowland in 1879 (see 'The Physical Papers of Henry Augustus Rowland'); but the prestige of Joule was so great that the superiority of Rowland's work was not generally recognized for many years. Rowland's method was similar to that of Joule, but he worked with far better apparatus, and took advantage of the advances that had been made since Joule's work was done, both in calorimetry and in thermometry. It was in the course of this work that Rowland made the discovery that when temperature is defined in accordance with the scale of the normal, constant-volume air thermometer, the specific heat of water has a minimum value at a little above 30° C.,—a discovery which implies a high degree of precision in the experimental methods employed, and which has been abundantly verified by later investigators. Rowland's value of the mechanical equivalent of heat may be stated as follows: Taking as the unit of heat the quantity of heat required to raise the temperature of one kilogram of water from 14.5° C. to 15.5° C., the mechanical equivalent is 427.4 kilogram-metres, in the latitude of Baltimore. If the unit of heat is the quantity of heat required to raise the temperature of a pound of water from 59° F. to 60° F., then the mechanical equivalent is 779.0 foot-pounds. If the unit of heat is the quantity of heat required to raise the temperature of one gram of water from 14.5° C. to 15.5° C., then the mechanical equivalent is 41,890,000 ergs. Numerous other experimenters have made determinations of the mechanical equivalent, both by the method followed by Joule and Rowland, and by other methods. Prominent among these is Griffiths, who heated the water in his calorimeter mainly by means of a known electrical current, traversing a known resistance, and hence giving out a known quantity of heat. Taking as a unit of heat the quantity of heat required to raise the temperature of a kilogram of water from 14.5° C. to 15.5° C., Griffiths found the mechanical equivalent to be 427.45 kilogram-metres in the latitude of Greenwich. Rowland's value, when expressed in these same units and corrected to the latitude of Greenwich, is 427.0. (For further details concerning the experimental determination of the mechanical equivalent, consult Preston, 'Theory of Heat'; and for numerous interesting illustrations of the first law of thermodynamics, consult Tyndall, 'Heat a Mode of Motion.')

The "second law of thermodynamics" is hard to explain in a limited space, or without the use of the higher mathematics; and, as Rankine remarked, its exposition has been much neglected by the writers of popular works, so that "the consequence is that most of those who depend altogether on such works for their scientific information remain in ignorance, not only of the second law, but of the fact that there is a second law; and knowing the first law only, imagine that they know the whole principles of thermodynamics." In its simplest form, the "second law" merely states that heat always tends to pass from a hotter body to a colder one. This fact is obvious enough in its simpler manifestations; for every housewife knows that to make the kettle boil she must put it on the stove, and not in the refrigerator. It is not so evident, however, that there are no conditions whatever under which heat will pass of its own natural tendency from a lower temperature to a higher one. It is not evident at first thought, for example, that we cannot make a burning glass big enough to give a temperature, at its focus, which shall be higher than the temperature of the sun; yet we cannot do so, if the second law of thermodynamics is true, for the heat at the focus of the glass certainly comes from the sun, and if that focus were hotter than the sun, we should have a case in which heat is passing by its own natural radiative tendency from a cooler body (the sun) to a hotter one (the focus of the glass). The second law was first proposed, as a broad principle of nature, by Clausius; and although numerous distinguished mathematicians and physicists have questioned its validity from time to time, it is now recognized as a great, universal truth, applicable to all classes of phenomena, without exception. It is indeed true that heat can be abstracted from a body and made to pass into a warmer one, and this is actually done on a commercial scale in cold storage plants, and in the manufacture of artificial ice; but the point is that this feat cannot be accomplished without the expenditure of energy. We are to think of heat, in its tendency to pass from a higher temperature to a lower one, in much the same way as we think of water tending to run down hill. Water will not run up hill of its own accord, but it may be forced to pass from a lower level to a higher one, by the expenditure of energy upon a pump or other equivalent device. The correctness of Clausius' hypothesis with regard to heat is substantiated by the fact that no case has yet been discovered in which it is demonstrably violated. On the other hand, many previously unknown phenomena of nature have been predicted by its aid, and in every instance subsequent experiment has borne out the prediction in every respect. (For a short account of some of the better known objections that have been urged against the soundness of the "second law," consult the latter portion of Browne's translation of Clausius's 'Mechanical Theory of Heat'.)

In studying the transformation of heat-energy into mechanical energy (or the reverse), it is customary to think of the conversion as being performed by a suitable type of heat-engine; for this conception helps to make the problem definite, so that the mind can readily grasp the principles involved. The imaginary engine is usually conceived to be perfect in construction, so as to run without friction and without losses by radiation or conduction. In fact, the material of which the engine is composed is assumed to be incapable of absorbing any heat at all. Some of its parts may, however, be assumed to be perfectly transparent to heat, and others to be absolutely opaque to it; and we may make such other extravagant assumptions as may be convenient for the discussion of the problem in hand, the only office of the imaginary engine being to assist the mind in the presentation and discussion of the essential facts, whatever those may be. These

fictive engines are usually assumed, furthermore, to be "perfectly reversible," so that when, by the expenditure of mechanical power, they are forced to run backwards, all of the normal operations of the engine take place precisely as before, but in a contrary sense. If, for example, the engine, at some instant in its forward motion, absorbed a quantity Q of heat from an outside body whose temperature was T, then when the engine reaches the corresponding state in its reversed motion, it must give out this same quantity, Q, of heat, and must give it out again to the same body from which it originally abstracted it, and at the same temperature, T. An engine which fulfils all of these various conditions is called a "perfectly reversible engine"; or, more briefly, an "ideal engine."

Carnot's Theorem.— In 1824 Carnot gave a remarkable theorem (see his 'Reflections on the Motive Power of Heat,' Thurston's translation), which may be stated in the following language: Of all the possible kinds of heat engine, which run by converting heat-energy into mechanical energy, and which take in their heat all at one given temperature and give out all that they do give out (if any) at another given temperature, there is none that is more efficient than the ideal, reversible engine; "efficiency" being defined as the fraction of the absorbed heat-energy that is converted into mechanical work. This theorem is of exceeding importance, as it holds true not only for the untold thousands of kinds of ideal engines that we might be able to think of at the present time, but also for any others that may depend upon principles of nature as yet undiscovered; always supposing that the two fundamental laws of thermodynamics, as stated above, are true. In Carnot's time, heat was believed to be a substance; and Carnot's proof of his theorem is based upon this view. After the newer conception of heat had been attained, however, Clausius proved that Carnot's theorem is capable of equally sound demonstration in accordance with the two thermodynamical laws now admitted. The proof is as follows: Let us assume that the theorem is false, and that there is some other engine, which we will designate as B, which is more efficient than some particular ideal reversible engine, A, which runs between the same two temperature limits. Let T_1 be the temperature at which both engines take in their heat, and let T_2 be the temperature at which each rejects such heat (if any) as it does not transform into work. Let H_1 and H_2, respectively, be the quantities of heat taken in and rejected, during a given time, by the reversible engine, A, and let H'_1 and H'_2 be the quantities taken in and rejected, respectively, by the other engine B. The quantities of heat that are transformed into work by A and B, respectively, are then $(H_1 - H_2)$ and $(H'_1 - H'_2)$; and the efficiencies are respectively $(H_1 - H_2)/H_1$ and $(H'_1 - H'_2)/H'_1$. The condition that we are assuming, in violation of the theorem, is that the efficiency of the engine B is greater than that of A; that is, $(H'_1 - H'_2)/H'_1 > (H_1 - H_2)/H_1$; or, what is the same thing, $H_1(H'_1 - H'_2) > H'_1(H_1 - H_2)$. Now suppose that the two engines are coupled together so that the engine B runs forward, and drives the reversible engine, A backward. Then A, owing to its reversibility, for every $(H_1 - H_2)$ units of mechanical work that it absorbs, takes in H_2 units of heat at the temperature T_2, and rejects H_1 units of heat at the higher temperature, T_1; while the other engine, B, for every $(H'_1 - H'_2)$ units of mechanical work that it performs, takes in H'_1 units of heat at the higher temperature, T_1, and rejects H'_2 at the lower temperature, T_2. Now in the case supposed, where one of the engines drives the other one backward, the mechanical energy developed by the engine B is entirely absorbed by the reversed engine, A. Hence we have $(H'_1 - H'_2) = (H_1 - H_2)$; and this equation, taken in connection with the foregoing inequality, gives $H_1 > H'_1$. That is, the heat delivered by the doubled engine to the source whose temperature is T_1, is greater than the heat that is being withdrawn from that source; so that if we regard the doubled engine as a single machine, we have a case in which heat is passing, by its own natural tendency and without external compulsion, from a temperature T_2 to a higher temperature, T_1. But this is contrary to the second law of thermodynamics; and hence if that law is sound, it must be that no such engine as B exists. In other words, there is no engine which takes its heat all at a temperature T_1, and rejects what it does reject at a lower temperature T_2, which has a higher efficiency than the ideal reversible engine running between these same temperature limits. It will be observed that in case both of the engines are reversible, the foregoing proof can easily be made to show that neither one is more efficient than the other one. It follows, therefore, that all ideal reversible engines which take in no heat except at T_1, and reject none except at T_2, have the same identical efficiency; and this efficiency can therefore depend upon nothing but the two temperatures T_1 and T_2. In the language of mathematics, the efficiency of an ideal reversible engine which runs as here described is a "function" of the temperatures at which heat is absorbed and rejected, and of nothing else. In the foregoing demonstration it was assumed that all of the heat taken in by the engine B is either transformed into mechanical energy or rejected at the temperature T_2. If the engine B is of such a kind that this condition is not fulfilled, by reason of the engine losing some of its heat at temperatures intermediate to T_1 and T_2 (or by reason of any other imperfection in design or construction), then the theorem is still true; for the assumption that we have made above is the least favorable to the demonstration.

Absolute Temperature.— Let us consider an ideal, reversible engine, which in each unit of time takes in H_1 units of heat at the temperature T_1, and rejects H_2 units of heat at the temperature T_2. Then the efficiency of the engine is $(H_1 - H_2)/H_1$; and this (as we have seen) must be equal to some function of T_1 and T It will be more convenient, however, to write the efficiency in the form $1 - (H_2/H_1)$; which is obviously permissible. Since this is a function of the two temperatures, so also is H_1/H_2; and we may write $H_1/H_2 = f(T_1, T_2)$. Now H_2, being the heat rejected by the given engine at the temperature T_2, may be used again in a second ideal reversible engine, which we may assume to take its heat at T_2, and to reject what it does reject (if any) at some still lower tem-

perature, T_3. The second engine, considered separately, would give a second equation entirely analogous to the one already written; and we should have $H_2/H_3 = f(T_2, T_3)$. But we might consider the two engines, coupled together, to constitute a single ideal reversible engine, taking in a quantity H_1 of heat at T_1, and rejecting a quantity H_3 at the temperature T_3. From this point of view we could write $H_1/H_3 = f(T_1, T_3)$. But if we multiply H_1/H_2 by H_2/H_3, we obtain H_1/H_3; and hence we see that the function f must be of such a nature that we have the identical relation

$$f(T_1, T_2) \cdot f(T_2, T_3) = f(T_1, T_3),$$

whatever the values of T_1, T_2 and T_3. Examination of this equation will show that the disappearance of T_2 by the multiplication of the two terms in the first member involves that the function f shall be of the form

$$f(T_1, T_2) = F(T_1)/F(T_2).$$

Hence we have the general relation

$$H_1/H_2 = F(T_1)/F(T_2);$$

H_1 and H_2 being, respectively, the quantities of heat absorbed and emitted by any ideal reversible engine, at the temperatures T_1 and T_2; the engine being supposed to absorb no heat except at T_1, and to reject none except at T_2. The algebraic form of the function $F(T)$ will depend, evidently, upon the kind of thermometer that is used in defining the temperature T; but whatever the form of the function may be, its numerical value will always be the same for any fixed temperature, no matter what the nature of the thermometric scale may be, from which it is obtained. This follows from the fact that the last equation above must always hold true, and H_1 and H_2 are not dependent in any way upon any thermometric scale. The independence of the numerical value of $F(T)$ of all arbitrary thermometric scales suggested to Lord Kelvin the possibility of computing the numerical values of the function, and basing upon these values a new thermometric scale, which he called the "absolute scale," since its readings would be "absolute," in the sense of being independent of the properties of any particular kind of matter. Preliminary investigations of the quantities of heat absorbed and rejected by an ideal reversible engine in which the work is performed by the expansion of air indicated that the numerical values of the function $F(T)$ can be expressed in the form $F(T) = T + C + x$, when T is the temperature according to the normal, constant-volume air thermometer (see THERMOMETRY); C being a constant, and x a small variable term, whose value, between the freezing and boiling points of water, never exceeds a very small fraction of a degree. For the details of the method by which the numerical values of the function $F(T)$ are evaluated, reference must be made to special works on thermodynamics, and to papers on the subject of absolute temperature. (See, for example, Lord Kelvin's article on HEAT, in the 'Encyclopedia Britannica.') It is sufficient, here, to say that by the application of the two fundamental principles of thermodynamics to the phenomena that occur when a mass of gas changes its state by an infinitesimal amount, it is possible to deduce a differential equation which, when integrated for the conditions that prevail in a constant-volume thermometer filled with the kind of gas under consideration, will give a finite relation between the scale of the gas thermometer and the "absolute scale." One of the most important terms in this differential equation relates to the change of internal energy experienced by a gas when the volume of the gas changes while the temperature remains constant. In order to evaluate this term, special experiments are necessary, in which the gas is caused to change its volume, while the temperature is constant. Joule and Kelvin were the first to devise an experiment capable of yielding accurate results of this character, and the work that they did along these lines some 40 years ago has never yet been verified or repeated, although it constitutes the basis of all that we know, to-day, about the numerical corrections that must be applied to the readings of a gas thermometer, in order to reduce those readings to the absolute scale. In their experiments, the gas was caused to expand through a porous plug, and the quantity of energy that must be added to it in order to prevent any change of temperature by this "free expansion" was determined by calculation. It is impossible to enter, in this place, upon the details of their work; but the writer of the present article has made a careful examination of the data given by Joule and Kelvin, and he finds that when the temperature is measured by the normal constant-volume hydrogen or nitrogen thermometer, in which the pressure at the freezing point of water is that due to one metre of mercury, and which is graduated according to the centigrade scale so as to read 0° at the freezing point of water and 100° at the boiling point, (1) there must be a constant term of 273.10° added to the reading of the thermometer in order to obtain the reading of the instrument on the absolute scale, and also (2) a small variable term, whose values are given in the second and third columns of the accompanying table.

Temperature by Gas Thermometer	Variable part of the correction to reduce to the absolute scale	
	Nitrogen thermometer	Hydrogen thermometer
0° C.	0.000°	0.000°
10°	— 0.003	+ 0.006
20°	— 0.006	+ 0.006
30°	— 0.007	+ 0.007
40°	— 0.008	+ 0.004
50°	— 0.008	0.000
60°	— 0.007	— 0.003
70°	— 0.006	— 0.006
80°	— 0.004	— 0.007
90°	— 0.002	— 0.005
100°	0.000	0.000

The corrections here given are different from those usually quoted, but it is believed that they are more accurate. In the case of the hydrogen thermometer, it will be observed that from 0° C. to 50° C. the corrections are positive, while from 50° C. to 100° C. they are negative. However improbable this change of sign may appear, it is certain that the differences between the readings of the hydrogen and nitrogen thermometers, as deduced from the corrections here given, correspond very faithfully with the actual differences as observed at the International Bureau of Weights and Measures, at Paris. Owing to the smallness of the variable part of the correction, it is usual, in writings upon engineering topics,

and upon thermodynamics generally, to take note only of the large constant term that is to be added, and to treat absolute temperature as though it were identical with the temperature as read from a constant-volume gas thermometer, save for the addition of the constant, 273.10° C. In other words, if t is the absolute temperature corresponding to a given reading T on the scale of a gas thermometer, it is customary to assume that $t = T + 273.10°$, if the thermometer is graduated on the centigrade plan, or $t = T + 459.58°$, if the graduation is according to Fahrenheit.

Students of thermodynamics are often greatly confused by the introduction of the idea of "entropy"; and while this subject requires the higher mathematics for its adequate discussion, a few words may be given to it here. When a body whose state at any given instant is completely defined by two independent variables, undergoes any infinitesimal but reversible change on account of corresponding infinitesimal changes in the two defining variables, it will, in general, absorb or reject a certain infinitesimal amount of heat; and it is easy to form a differential equation of the first order and degree, which will express the quantity of heat that is absorbed; the expression being taken negative, if there is rejection of heat instead of absorption. We know, from the theory of differential equations, that the equation so formed can always be multiplied by some factor (the "integrating factor") which shall cause it to become an exact differential of some function of the variables whose differentials it contains; but, so far as pure mathematics is concerned, it is impossible to say, in advance, what that integrating factor will be, or what the nature of the function may prove to be, of which the modified expression is the exact differential. By the aid of the second law of thermodynamics, however, it may be shown that the reciprocal of the absolute temperature at which the infinitesimal transformation takes place is always an integrating factor of the differential equation in question. In other words, having written the differential expression for the quantity of heat absorbed by the body, we know that we only have to divide it by the absolute temperature of the body, in order to cause it to become the exact differential of some function of the variables. The function whose existence is thus indicated is called the "entropy" of the body, and in the study of thermodynamics this function is a very convenient thing, because its introduction simplifies the treatment of many problems. The main difficulty that students experience in connection with it, is the difficulty of assigning to "entropy" any precise physical significance. It is probably better not to try to give any physical interpretation of this sort; for it is sufficient for all purposes to merely recognize the existence of the function, the very fact of its existence suggesting certain mathematical transformations which are exceedingly useful. The suggestion has sometimes been made, that it may prove to be possible to devise an instrument which shall enable us to measure the value of the entropy of a body directly, just as a thermometer measures the value of a temperature. If this could be done, the imagination of the student of thermodynamics would doubtless be greatly assisted; but it does not appear that the hope of discovering an instrument of this sort is at all well founded.

In studying the thermodynamic behavior of a body, the state of the body is defined by giving as many of its measureable attributes as may be necessary in order to fix the condition of the body absolutely. These measureable attributes are represented by letters, and are taken as independent variables. Then, by treating these independent variables by known mathematical methods, we can deduce certain conclusions with regard to the behavior of the body itself. Theoretically, there is no reason why the number of independent variables may not be as great as we please; but in all of the more important applications of thermodynamics it is found to be sufficient to take two independent variables. In the case of a gas, for example, it is usually sufficient to take two such variables, provided the gas is in a quiescent condition, and homogeneous throughout. When the possibility of internal motions is admitted, and the gas differs in composition or in other respects in its different parts, it is necessary to take more than two variables; but these cases will not be considered in the present article. Some latitude is permissible as to the variables that are selected for representing the state of the gas, but for the present we shall consider the state of the gas as being thoroughly defined when we know the pressure, P, that it exerts upon each unit of area of the wall of its containing vessel, and also the volume, V, occupied by each unit of its mass. Other attributes of the gas may indeed vary, as well as P and V; but if P and V are really sufficient to define the state of the gas completely, then these other attributes that are capable of variation at the same time must all be expressible as functions of the two variables P and V. The temperature of the gas is one of the most notable physical attributes which is capable of variation; and it follows that there must be a relation connecting the temperature, T, with the variables P and V. This equation, which is called the "characteristic equation," or sometimes the "elastic equation," may be written, tentatively, in the general form $T = F(P, V)$. While we know that an equation of this nature must exist, we do not know the exact form of the function F for any actual substance. For gases, however, we know its approximate form, throughout certain ranges of the variables P and V. Robert Boyle showed that so long as the temperature of the gas is kept constant, and the gas is not too highly compressed nor too near to its point of liquefaction, the volume varies very nearly as the reciprocal of the pressure; and Charles discovered (to express it in modern language) that so long as the pressure upon the gas remains constant, the volume is nearly proportional to the absolute temperature. Taking these two laws into account, it is evident that the form of the function F must be such that, for such values of the variables P and V as prevail under the conditions in which the laws of Boyle and Charles are nearly true, we must have

$$T = kPV, \text{ or } P = \frac{RT}{V};$$

T being the absolute temperature, and k and R being constants whose values are to be determined by experiment. For many practical purposes, this relation between P, V and T is sufficiently exact. When the gas is highly compressed, however, or when it is near to the

point of liquefaction, it is found to depart very materially from the foregoing equation. Many attempts have been made to find a more general law connecting the temperature, pressure and volume, and such equations have been given by Rankine, Van der Waals, Clausius, Sarrau, and other writers. As the equation of Van der Waals has been of special service, and has figured to a great extent in the thermodynamical literature of recent times, it may be appropriately cited as an example of the attempts that have been made to find a superior form of elastic equation. The equation in question has the form

$$P = \frac{RT}{V-b} - \frac{a}{V^2},$$

where R, T, V and P have the same significance as before, and a and b are very small constants. If a and b are both zero, this equation reduces to the form previously given; and the same is true if V is very large indeed (that is, if the gas is very rare), since in that case the effects of the small constants a and b are negligeable. If we assign to T any constant value that we please, we may, from Van der Waals' equation, trace all the possible relations that P and V can have, at this one temperature. That is, when a, b, and R are known, and we have assigned a fixed arbitrary value to T, we may then select any

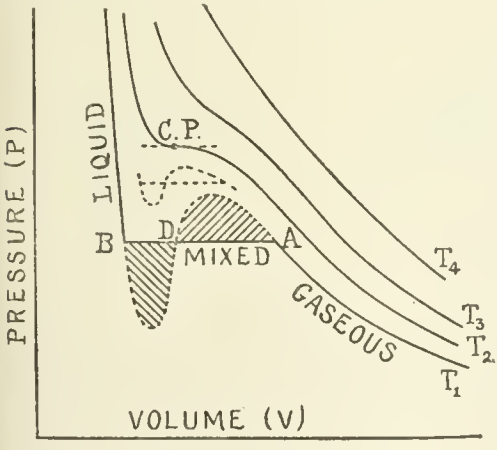


FIG. 1.—Isothermals of Van der Waals' Equation.

number of values of V, and compute the value of P that corresponds to each one of them. If we plot the values so computed, by laying off horizontal distances to represent the values of V, and vertical distances to represent the corresponding values of P, we shall obtain a series of points representing the various states that the gas is capable of assuming, while T keeps its fixed value; and if we make the calculated points numerous enough, we may draw through them a curved line, which may be taken to represent the continuous series of states through which the gas passes, as the pressure is continuously varied while the temperature remains constant. Such lines are called "isothermals," on account of the constancy of the temperature along them. Several such lines, as computed for as many different values of T from Van der Waals' equation are shown in Fig. 1. If the temperature is high (as at T_4), the isothermal line may be indistinguishable in form from the corresponding line as computed from the elastic equation of Boyle and Charles. If, on the other hand, the temperature is sufficiently low, as is indicated at T_1, the isothermal line will have a very different shape. To trace the significance of this shape, let us begin at the right-hand end of the isothermal T_1, and see what happens when the pressure upon the gas is continuously increased. As the pressure grows greater, the volume of the gas diminishes; but there is no notable change of any other sort until a certain point A is reached. When this point is attained, any attempt to further increase the pressure merely results in the condensation of a part of the gas; the pressure remaining constant (as indicated by the horizontal line ADB) until, at B, the gas is entirely condensed into the liquid form. Further application of pressure then causes but a slight reduction of volume; a fact which is indicated by the steepness of the isothermal line above B. We have here described what actually happens when the gas is compressed along the isothermal T_1; but it must be noted that the plot of this isothermal from Van der Waals' equation does not give a straight part, ADB, but a reversed curve between A and B, as indicated by the dotted line. If we could actually make the gas follow this dotted line, we could cause it to pass from the gaseous condition into the liquid condition, without any discontinuity in state; that is, in such a manner that it would never be partly liquid and partly gaseous, and so that we should not be able to see when the conversion from one state to the other took place. It can be shown, however, that the states of the gas which correspond to the dotted part of the isothermal are essentially unstable, so that the attempt to make the gas follow the dotted portion of the theoretical isothermal is like trying to balance a pyramid upon its point. The line ADB which the gas actually follows in preference to the double loop, is in such a position that the areas of the two shaded loops are equal, as was first shown by Maxwell. A portion of the dotted loops in the immediate vicinity of A and B can be actually realized in the laboratory, by careful experiment; but the instability speedily becomes too marked to permit of the experiments being carried far. At temperatures intermediate between T_1 and T_4 the isothermals have a character intermediate between those shown for those temperatures. As we proceed upward from T_1, the loops on the isothermals grow less and less pronounced, as is indicated by the partial, dotted isothermal; and we presently arrive at one particular isothermal, T_2, where the loops just cease to exist. At any temperature higher than T_2 it is therefore impossible to liquefy the gas by the application of any pressure whatever, no matter how great. Hence the temperature T_2 is the "critical temperature" of the gas. (See CRITICAL POINT.) There is one point on this critical isothermal (marked "C. P."), at which the isothermal is precisely horizontal, and where it also has a point of inflection; and this point corresponds to the critical point of the gas; its temperature being the critical temperature, its volume the critical volume, and its pressure the critical pressure.

Although gases obey the characteristic equation of Boyle and Charles very closely when they are not too highly compressed and not too near to condensation, there is no gas which obeys

it rigorously under all conditions. It is often convenient, however, to assume the existence of a gas of this sort, for the purpose of illustrating general principles, or of obtaining approximate solutions of thermodynamical problems; and the ideal (but non-existent) gas which fulfils the relation of Boyle and Charles absolutely and under all circumstances is commonly called a "perfect gas," though "ideal gas" would appear to be a preferable name. In applying the conception of a perfect gas, it is customary to assume the further condition that when a gas of this sort changes its volume at constant temperature, the heat that it absorbs is exactly equivalent to the external work that the gas does, in expanding against the external pressure that the containing vessel exerts upon it. In other words, it is customary to assume that the perfect gas, in addition to obeying the laws of Boyle and Charles perfectly, is also so constituted that its internal energy depends upon nothing but the temperature of the gas. The characteristic equations of Van der Waals and others are decided improvements upon the equation of Boyle and Charles, and they represent, very well, the nature of the phenomena that occur in a gas in the vicinity of the critical point. None of them takes any account, however, of the fact that a body is capable of existing in the solid state, as well as in the liquid and gaseous states; and the first characteristic equation complete enough to take the solid state into account also, has yet to be proposed.

When a body passes from one condition of pressure and density to another, it either absorbs or emits heat, unless certain special conditions are fulfilled. To avoid circumlocution, we may speak of it as always "absorbing" heat; the emission of heat being considered to be merely a case of negative absorption. Suppose, for example, that a body is in the state corresponding to A, in Fig. 2; and for definiteness let us suppose that the body under consideration is a gas, although the reasoning will apply equally well to a liquid or to a homogeneous, isotropic solid. The height of A above the horizontal reference line then represents, on some convenient scale, the pressure to which each unit of the bounding surface of the gas is exposed; and the distance of A from the vertical reference line at the left corresponds, upon some other convenient scale, to the volume occupied by a unit mass of the gas. Now if the gas be caused to pass from the condition represented by A to that which is represented by B, by passing through all the intermediate conditions that are represented by the points that are intermediate to A and B on the line ACB, the gas is said to pass from the state A to the state B along the "path" ACB. In general, a change of this sort will be accompanied by an absorption of heat; the heat which is absorbed being partly expended in increasing the internal energy of the gas, and partly in the performance of external work. It is a consequence of the first law of thermodynamics that the change in the internal energy of the gas is entirely independent of the shape of the path ACB, and depends only upon the positions of the points A and B. That portion of the absorbed heat which goes to increase the internal energy of the gas therefore depends upon nothing but the positions of A and B. The case is different, however, with that portion of the absorbed heat which is consumed in the performance of external work. Consider, for example, the state of the gas at the point C. The pressure upon the gas, per unit of area of the containing vessel, is represented by the vertical line CE; and when the volume of the gas increases by the slight amount EF, the external work that the gas does is represented by the product of the pressure and the increase in volume; that is, it is represented by the area of the little rectangle CDFE. We may regard the area ACBNM as made up of an infinite number of infinitesimal rectangles, each of which is typified by the little rectangle that is shown; and hence it follows that the total quantity of external work done by the gas as it passes from the condition A to the condition B, along the path ACB, is represented by the area included between the curve ACB and the straight lines AM, MN, and NB. Obviously this area depends upon the form of the path ACB; and hence the external work that is done by the gas also depends upon the form of that path, and so also does that part of the heat absorbed along ACB, which is consumed in performing this work.

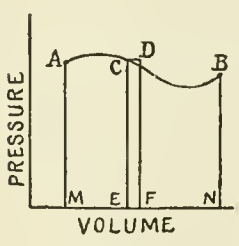


Fig. 2.

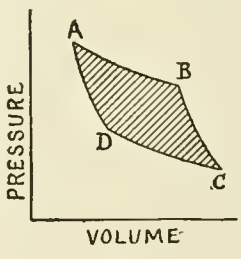


Fig. 3.

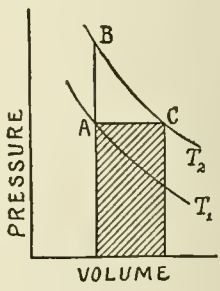


Fig. 4.

When a gas (or other body) describes a *closed* path, such as is shown in Fig. 3, and returns finally to its original state, then the internal energy of the gas also returns to its original value; and the total quantity of heat that is absorbed by the gas during its passage around the closed path is therefore represented entirely by the external work that the gas does. That is, it is represented by the area of the closed path, as shown shaded in Fig. 3. A closed path of this sort is called a "cycle," and the consideration of cycles of various kinds is very important in many branches of thermodynamical reasoning. If AB and DC, in Fig. 3, represent isothermal lines, and AD and BC represent adiabatic lines (that is, lines along which there is no absorption or rejection of heat by the gas), then the cycle ABCDA is called a "Carnot cycle," because it is the kind of a

cycle that Carnot imagined his ideal, reversible engine to describe. (See Carnot's principle, enunciated in the earlier part of this article.)

When a gas is heated from a temperature T_1 to another temperature T_2, the quantity of heat absorbed in the process will depend upon the precise way in which the passage from one of these temperatures to the other is effected. Thus let A, in Fig. 4, represent the initial state of the gas, and let the curved lines, T_1 and T_2, represent the isothermals corresponding to the temperatures T_1 and T_2. If we cause the gas to pass from the isothermal T_1 to the isothermal T_2 along the horizontal line AC, we are heating the gas while its pressure remains constant; and if we cause it to pass from T_1 to T_2 along the vertical line AB, we are heating it while its volume remains constant. If the difference in temperature between T_1 and T_2 is one degree, and the mass of the gas is (as we have already assumed) unity, then the quantity of heat absorbed along AB is the "specific heat at constant volume," and the quantity absorbed along AC is the "specific heat at constant pressure." That these two specific heats are really different will be evident from the fact (1) that the internal energy of the gas in the states B and C are not necessarily the same, unless the gas is a "perfect gas"; and also from the fact (2) that the heat that is absorbed along the path AC has to be partially expended in doing the external work represented by the shaded area; while along the path AB there is no external work done.

The fact that in an ideal, reversible heat engine the efficiency does not depend at all upon the nature of the substance whose expansion does the work, is sometimes hard for the beginner in thermodynamical reasoning to understand, for the reason that objections occur to him which appear to controvert the principle, and to be themselves unanswerable. There is an answer, however, to every objection that can be urged. One of the commonest of the difficulties is this: In a steam engine, water is pumped into the boiler, and is then evaporated by the expenditure of a large amount of heat. The steam is next passed to the cylinder of the engine and expanded, after which it is turned into the condenser and re-converted into water. The quantity of heat which is expended upon the water in merely converting it into steam (and which is known as the "latent heat of vaporization") appears to be wasted in large measure, because the greater part of it is not converted into mechanical energy by the engine, but is merely rejected into the condenser. Engines have been designed and built, in which the water that is commonly used is replaced by some other liquid (such as ether or carbon disulphide) which has a much smaller latent heat of vaporization, in the belief that this apparently large source of loss could be avoided; but such engines have invariably proved disappointing, any trifling superiority that they may have shown from time to time being attributable to other causes than the smaller latent heat of vaporization of the working fluid. The reason for this is, that there is an intimate relation between the pressure of a saturated vapor at a given temperature, and the latent heat of vaporization of the liquid. This relation is sometimes known as the "second thermodynamic relation," and sometimes as "Clapeyron's equation." The elucidation of this matter requires a knowledge of the infinitesimal calculus, and reference must be made for it to the standard works on thermodynamics. Much of the practical experimental work that has been done upon the hot-air engine has probably been inspired by ignorance of the existence, or at least of the significance, of this "second thermodynamic relation."

(See Heat; Specific Heat; Zero; Thermometer; Thermometry; Gases, Kinetic Theory of; Gases, General Properties of; and other similar articles in this encyclopedia. Consult, also, Maxwell, 'Theory of Heat'; Clausius, 'Mechanical Theory of Heat,' Browne's translation; Preston, 'Theory of Heat'; Poincaré, 'Thermodynamique'; Mach, 'Principien der Wärmelehre'; Magie, 'The Second Principle of Thermodynamics.'

A. D. Risteen, Ph.D.,
Editorial Staff, 'Encyclopedia Americana.'

Thermo-Electricity. If an electrical circuit is constructed partly of one metal and partly of another, and one of the points of junction between the dissimilar metals is heated while the other is kept cool, a current of electricity will be caused to flow in the circuit. This fundamental fact was discovered by Seebeck in 1821. The electricity thus generated is not in any wise different from that which is generated by an ordinary galvanic battery; but on account of its mode of production it is called "thermo-electricity." The electromotive force that is set up in a circuit under the circumstances here described is always quite small, and its intensity depends (1) upon the nature of the metals of which the circuit is composed, (2) upon the difference in temperature between the two junctions where the dissimilar metals come together, and (3) upon the average temperature of these junctions. For the sake of definiteness, let the two metals of which the circuit is composed be designated by the letters X and Y. The phenomena of thermo-electricity may then be described in the following mathematical language: It is known from experiment that when the two metals X and Y are brought together so that their point of contact has the temperature T, an electromotive force exists between the two, which tends to send a current (say) from X into Y; and it is also known that the magnitude of this electromotive force can be expressed as a parabolic function of the temperature, T. Thus if E is the electromotive force in question, the facts of experiment can be adequately expressed by a relation of the form $E = a + bT + cT^2$; where a, b, and c are constants whose values depend upon the natures of the metals X and Y. In the actual circuit there are necessarily two junctions across which electromotive forces of this character exist. Let the temperatures of these junctions be respectively T_1 and T_2. Then the foregoing formula shows that across the junction whose temperature is T_1 there is an electromotive force of intensity, $E_1 = a + bT_1 + cT_1^2$, tending to send a current from X into Y; and across the junction whose temperature is T_2 there is a similar electromotive force of intensity,

$$E_2 = a + bT_2 + cT_2^2$$

also tending to send a current from X into Y. These electromotive forces being opposed to

each other, so far as the production of a current around the circuit is concerned, the effective electromotive force around the circuit is the difference between E_1 and E_2; and if we denote this effective electromotive force by the letter F, we have

$$F = E_2 - E_1 = b(T_2 - T_1) + c(T_2^2 - T_1^2),$$

or

$$F = (T_2 - T_1)\,[b + c(T_2 + T_1)].$$

From this last equation it is evident that so long as the average temperature of the two junctions is constant (or, in other words, so long as $T_2 + T_1$ is constant), the electromotive force will be proportional to the difference in temperature between the two junctions. But it is also evident that when the average temperature of the two junctions is such that the relation

$$b + c(T_2 + T_1) = 0$$

is fulfilled (or, in other words, when the average temperature of the two junctions is numerically equal to $-b/2c$), there will be no thermo-electromotive force in the circuit (and therefore no current), no matter what the difference in temperature between the two junctions may be. This average temperature, for which there is no thermo-electric effect in a circuit, has a definite value for every pair of metals, and is known as the "neutral temperature" for that pair. The values of the constants b and c, in the foregoing formulæ, could be determined experimentally, and recorded in tabular form for various pairs of metals. It is usual, however, to record the experimental data in a somewhat different manner, as we proceed to explain. If the average of the two temperatures T_1 and T_2 be denoted by T_0, then the formula for the effective electromotive force, F, may be written

$$F = (T_2 - T_1)\,(b + 2cT_0).$$

The constants b and c refer, it will be understood, to a particular *pair* of metals; but it is found that their values can be satisfactorily represented as the differences between constants which can be stated for the two metals separately. Thus b can be expressed in the form $b = B' - B''$, and $2c$ can be expressed in the form $2c = C' - C''$; B' and C' being constants whose values depend solely upon the metal X, and B'' and C'' being constants whose values depend, in a similar manner, solely upon the metal Y. The expression for the effective electromotive force F can therefore be written thus:

$$F = (T_2 - T_1)\,[(B' - B'') + (C' - C'')T_0].$$

The values of the constants B and C for the different metals vary somewhat with the physical condition of the metals; but the data given in the accompanying table will show the general nature of these constants, and will also suffice to represent, with some degree of approximation, the actual magnitude of the thermo-electric effects that may be expected from circuits composed of the metals there represented. In applying this table, temperatures are supposed to be expressed on the ordinary centigrade scale, which defines the freezing point of water to be 0°, and the boiling point to be 100°; and the results are expressed in hundred-millionths of a volt, so that to reduce them to volts it is necessary to divide them by 100,000,000.

To illustrate the use of this table, let us compute the electromotive force of a circuit composed of iron and copper, when one of the junctions is kept at 0° C., and the other at 100° C. For iron we have $B = +1734$ and $C = -4.87$; and for copper we have $B = +136$ and $C = +0.95$. Hence we see that for this pair of metals $b = +1734 - 136 = +1598$, and $2c = -4.87 - 0.95 = -5.82$. The thermo-electromotive force in the circuit is therefore

$$F = (T_2 - T_1)\,(1598 - 5.82T_0).$$

But we have assumed that $T_2 = 100°$ and $T_1 = 0°$; hence $T_2 - T_1 = 100$, and $T_0 = 50°$, and we have $F = 100(1598 - 5.82 \times 50) = 130{,}700$. Dividing this by 100,000,000 to reduce it to volts, the final conclusion is, that a thermo-electric couple of the kind described will give an electromotive force of about 0.00131 of a volt (in round numbers). To find the "neutral point" of an iron-copper couple, we merely have to set the expression $1598 - 5.82T_0$ equal to zero, and solve the equation for T_0. Proceeding in this manner, we find that the desired neutral temperature is 274° C.

THERMO-ELECTRIC CONSTANTS OF METALS.

Metal	B	C
Iron	+ 1734	— 4.87
Steel	+ 1139	— 3.28
Soft platinum	— 61	— 1.10
Hard platinum	+ 260	— 0.75
Magnesium	+ 244	— 0.95
German silver	— 1207	— 5.12
Zinc	+ 234	+ 2.40
Silver	+ 214	+ 1.50
Gold	+ 283	+ 1.02
Copper	+ 136	+ 0.95
Lead	0	0.00
Tin	— 43	+ 0.55
Aluminum	— 77	+ 0.39

Nickel is not included in the foregoing table, because its behavior is anomalous. From — 18° C. to 175° C. its constants are $B = -2204$ and $C = -5.12$; but a short distance above 175° C. their values change profoundly, so that between 250° C. and 310° C. we have $B = -8449$ and $C = +24.1$. Above 340° C. we have, for this metal, the values $B = -307$ and $C = -5.12$. Antimony and bismuth are commonly used as the two metals in experimental thermo-electric circuits, since they yield an electromotive force which is larger than is obtainable under similar conditions by other metallic pairs. The thermo-electric constants of antimony and bismuth do not appear to have been determined with precision, however. When the average temperature of the two junctions (T_0) is about 20° C., the values of $B + CT_0$ are approximately as follows: Bismuth, pressed commercial wire, — 9700; bismuth, pure pressed wire, — 8900; bismuth crystal, axially, — 6500; bismuth crystal, equatorially, — 4500. Antimony, pressed commercial wire, + 600; antimony, pure pressed wire, + 280; antimony crystal, axially, + 2260; antimony crystal, equatorially, + 2640.

When a thermo-electric couple is generating an electrical current, heat is absorbed at the hot junction, and given out at the cold one. If an electric current is caused to flow across the junction of any two dissimilar metals, heat is either evolved or absorbed at the junction; and if an evolution of heat is observed when the current flows across from the metal X to the metal Y, there will be an absorption of heat when the current is made to flow from Y to X. This phenomenon, which was discovered by

Peltier, is known as the "Peltier effect." Lord Kelvin showed that in a thermo-electric circuit the reversible heat effects are not confined to the junctions themselves. He showed, in fact, that when an electrical current is caused to flow through a wire that is locally heated by a gas flame or otherwise, the current tends to cause a displacement, along the length of the wire, of the point of maximum temperature. The effect may be illustrated by thinking of the wire as a tube conveying a stream of some real fluid; the fluid taking up more or less of the heat, and carrying it along in such a way as to shift the point at which the temperature is greatest. The analogy is imperfect, however, because in the case of electricity the heat travels with the current in some metals, and against it in others. This phenomenon (which is known as the "Thomson effect") has an important bearing upon the theory of thermo-electricity, because in a thermo-electrical circuit the temperature is necessarily variable from point to point, and therefore the "Thomson effect" may (and in fact does) modify the phenomena considerably. The effect is zero in lead, but in nearly every conductor it is quite sensible. The consequences of the "Thomson effect" are discussed in two papers in the first volume of Lord Kelvin's 'Mathematical and Physical Papers.'

When a circuit contains several thermo-electric couples, with their successive junctions alternately heated and cooled, the total electromotive force that is produced is sensibly equal to the sum of all the electromotive forces that the several couples would produce, if each existed separately. Advantage is taken of this fact in the instrument known as the "thermo-pile," which consists of a series of small bars of antimony and bismuth (usually about 25 pairs altogether), disposed side by side so as to form an approximate cube, and insulated from one another by strips of paper or other non-conductor. These bars are soldered together at the ends so that a current, in order to traverse the system, must pass back and forth through alternate bars of bismuth and of antimony; the passage of the current from bismuth into antimony being always effected (let us say) at the right hand end of the little pile of bars, while the passage from antimony into bismuth is always effected at the left hand end. The two free ends of the thermo-pile being connected by a wire, a current of electricity flows through the circuit so formed, when either of the surfaces containing the soldered junctions is warmed, while the opposite one is kept cool. This instrument is used to a considerable extent for the detection, and even for the approximate estimation, of radiant heat; the current that it produces, and which is measured by a delicate galvanometer in the external part of the circuit, being taken as the index of the amount of the radiation. (See Tyndall, 'Contributions to Molecular Physics in the Domain of Radiant Heat.') The thermo-pile was invented by Nobili, but it was so greatly improved by Melloni that it is now often credited to him.

Many attempts have been made to construct a thermo-electric combination that would yield a current of electricity intense enough to be of commercial utility; but while such attempts have been partially successful, there is no great reason to suppose that thermo-electric generators will ever be of much practical value. The difficulties are partly structural and partly theoretical. In order to realize any considerable electromotive force, the number of elements must be very considerable; and the experience heretofore has been that a complicated thermo-pile is not particularly durable. Even if this objection can be overcome, there remains the serious one that there are theoretical reasons, based upon thermodynamics (q.v.), for believing that the efficiency of the thermo-pile, as an instrument for converting heat energy into electrical energy, can never be very high. In a particular case that was investigated by Lord Rayleigh, the maximum possible efficiency was found to be 6 per cent; and it is not likely that an efficiency materially greater than this will ever be actually attained with a thermo-pile that is large enough and durable enough to be of commercial value.

A. D. Risteen, Ph.D.,
Editorial Staff, 'Encyclopedia Americana.'

Thermograph (Greek, "to record heat"), any form of self-registering thermometer (q.v.), by which an automatic record of variations of temperature is kept. Many different types of thermograph have been made, of which the following may be especially noted: (1) Photographic thermographs, in which the position of the mercury thread in an ordinary thermometer is photographed upon a moving sensitive film, either continuously or at short intervals of time; the moving sensitive film being actuated by clockwork, so that the time at which any given impression was made can be nicely determined. (2) Metallic-strip thermographs, in which a recording pen is actuated by a strip of metal composed of two substances of differing expansibility, riveted or soldered together. When a strip of this kind is heated, one of its sides expands more than the other, and the result is that the strip becomes curved by an amount which serves as a measure of the temperature to which the strip has been exposed. The pen which makes the record moves radially on a disk of paper which is caused to revolve at a steady rate by means of clockwork. (3) Electric-contact thermographs, in which a fine platinum wire is caused to descend, at intervals, into the open upper end of the capillary tube of a sensitive mercurial thermometer. When the wire touches the mercury column, it completes an electrical circuit, and by this means the position of the mercury thread in the thermometer is recorded. (4) The manometric thermograph, in which the pressure in a closed vessel filled with a gas is taken as the index of the temperature; the pressure being recorded automatically, and the temperature being afterward inferred from the recorded pressure, by means of a theoretical formula, or else by direct comparison of the instrument, at different temperatures, with a standard thermometer. (The pressure of an isolated mass of gas of this kind is known to be sensibly proportional to the absolute temperature of the gas, so long as the volume is kept constant.)

Thermometer (Greek, "heat-measurer"), an instrument for determining the temperatures of bodies. The general problem of thermometry is considered, in this encyclopedia, under the heading Thermometry; and the present article will be devoted mainly to the consideration of the common mercury-in-glass form of the instrument, and to certain of its modifica-

tions. The mercury-in-glass thermometer depends for its action upon the fact that mercury expands about seven times as much as glass, for a given rise in temperature; so that when mercury is enclosed in a glass vessel, its apparent expansion is quite considerable. The mercury-in-glass thermometer consists essentially of four parts, these being (1) the mercury, (2) the spherical or cylindrical bulb of glass which contains it, (3) the fine tube which is attached to the bulb and which serves to make the expansion of the mercury evident, and (4) the graduated scale which is affixed to the capillary tube, and from which the indications of the instrument are read. In the manufacture of thermometers which are intended for accurate work, the mercury is carefully purified by filtration through leather under pressure, and by subsequent distillation, and, in many cases, by chemical treatment also; and immediately before the mercury is placed in the thermometer, it should be boiled so that it may be rendered free from moisture and from air. In the manufacture of the capillary stems of thermometers, some kind of glass which experience indicates to be adapted to this end is melted, and the operator takes up a ball of it on the end of his blowpipe, blowing it out gradually, and adding more glass to the mass from time to time. When the ball of molten glass has thus been brought to a convenient size, a second workman attaches his blowpipe to it also, and the two, still blowing, walk apart, so that the sphere of glass is drawn out into a very long and fine tube, which, when it has cooled, is cut into lengths and annealed. The calibre of each of these lengths is subsequently measured under the microscope, so that the instrument maker may know how large a bulb must be attached to each piece, in order that the degree-spaces on the finished thermometer may be of approximately the desired size. The bulb of the thermometer is usually made of a different kind of glass from the stem; and the process of making it consists simply in fusing to one end of the open stem a knob of the special glass, and then blowing it to size through the stem. In thermometers that are to be used for accurate scientific work, the bulbs should always be made of one of the three kinds of glass that are respectively known as "verre dur," Jena 16^{III}, and Jena 59^{III}. The first of these is a French glass, which has been demonstrated to be peculiarly adapted for use in thermometer bulbs, by the elaborate experiments made at the International Bureau of Weights and Measures, at Paris. The other two are made at Jena, Germany, and have been similarly proved to be adapted for use in accurate thermometers, by the experiments made at the Reichsanstalt, in Berlin. The stem and bulb of the thermometer being thus completed, the next step consists in cleaning them thoroughly on the inside. For this purpose they are washed out with hot nitric acid, with distilled water, and with ether. They are then thoroughly dried, preferably by repeatedly exhausting them, while hot, with an air pump, and then filling them again with air that has been carefully dried. The next operation consists in filling the thermometer with pure mercury. In order to do this, the bulb is heated until the air that it contains is partially expelled, and the open end of the stem is then dipped beneath the mercury. As the bulb cools, the air remaining within it contracts, and mercury rises through the stem until the bulb has become partially filled; this operation being repeated until the bulb is full. The instrument is next heated to a temperature considerably higher than the highest temperature to which it is to be exposed in use, the mercury that it contains becoming thereby so much expanded that it fills the entire stem and runs over at the top; and while the stem is still filled in this manner it is sealed off at the end by means of a blowpipe. In the higher grades of thermometers, a tiny pear-shaped bulb is left at the top of the stem, partly as a precaution against the destruction of the thermometer in case it is accidentally exposed to too high a temperature in its subsequent service, and partly as an aid in the calibration of the stem. (See below.) When such a bulb is provided, the stem may be sealed off at the end while the internal space is exhausted by means of an air pump, instead of while it is filled with mercury; or the tube may be filled, above the mercury column, with dry nitrogen or some other inert gas. The glass part of the instrument having been completed, it remains to affix the scale to the stem. In high grade thermometers, the scale is engraved upon the stem directly; but in the cheaper forms it is usually engraved or stamped upon a piece of metal or of wood, to which the thermometer is finally secured. Let us consider the high grade instruments first, and the cheaper ones afterward. Instruments of the former class are graduated by finding, experimentally, two definite points upon the stem, corresponding to two known temperatures; the two known temperatures which are selected for this purpose being the boiling point and freezing point of water. When these two points are found, the space between them is divided up into a certain number of equal parts, which are called degrees. In determining the position of the boiling point upon a thermometer, the instrument is placed in steam that is rising from water that is boiling freely under a barometric pressure equal to that which would be produced by a column of pure, ice-cold mercury, 760 millimetres high, at sea-level in latitude 45°. When the mercury column in the thermometer ceases rising and becomes stationary, the point opposite which it stands is marked upon the stem, and is called the "boiling point." If the barometric pressure under which the experiment is performed is not identically equal to the value assumed above, allowance must be made for that fact by the aid of the experiments of Regnault (or others) upon the variation of the boiling point of water per millimetre of change of barometric pressure. The boiling point having been marked upon the thermometer as here indicated, the instrument is then placed in a mixture of water and finely pulverized ice, as quickly as this can be safely done; and the point to which the mercury sinks is marked, and called the "freezing point." The distance, on the stem, between the boiling and freezing points is then marked off, by means of a dividing engine, into as many equal spaces as there are degrees between the freezing and boiling points of water, and (save for the affixing of numbers to the degree-marks) the thermometer is complete. It may be, of course, that the thermometer is to be divided into half degrees, or into tenths; but the operation is precisely the same, in this case, as it is when the division is to be made to degrees only.

We could evidently divide the space between the boiling point and the freezing point into as many equal "degrees" as we chose; for there is no reason, in the nature of things, why a "degree" could not have any one size, just as well as any other size. It is desirable, however, to have some uniform practice in this respect; and hence the manufacturers of thermometers invariably conform to one or the other of three standard systems. In France, and also for scientific work in nearly every country, it is customary to follow the plan introduced by Prof. Celsius of Upsala, which consists in dividing the fundamental interval between the two fixed points into 100 equal parts, the freezing point being called "zero," or 0°, and the boiling point 100°. This method of graduation is known as the "centigrade" (or "hundred-degree") system. For general purposes in the United States and in England, it is far commoner to graduate thermometers according to the system introduced by Fahrenheit of Dantzig, about 1714. In this system the interval between the freezing and boiling points is divided into 180 equal spaces, or "degrees"; but the freezing point is here called 32°, and the boiling point 212° (32° + 180° = 212°). There has been much discussion as to the reason that Fahrenheit had for dividing the fundamental interval into 180 equal parts; but there can be no doubt but that his zero point was intended to represent the greatest cold that was known in his day, this being obtained by mixing salt and snow. By adopting this lowest temperature as his zero, he probably sought to avoid the use of negative temperatures; but in these days when temperatures several hundred degrees lower than his zero can be produced, the significance of the 32 is lost, and we now adhere to it simply from custom. The third thermometric system that has been used to a considerable extent is that due to Réaumur. In this system the fundamental interval is divided into 80 equal degrees, and the freezing and boiling points are marked 0° and 80°, respectively. This method of graduation is extensively used in Germany upon thermometers intended for household purposes; but for most other purposes in that country it has given way to the centigrade system.

After a thermometer that is to be used for precise measurement has been made and graduated, it is subjected to certain experimental investigations, for the purpose of ascertaining the errors to which it may be liable. One of the most important of these investigations relates to the "calibration error," which is due to such irregularities of calibre as the bore of the stem may possess. In order to determine the calibration errors, a thread of mercury of suitable length is detached temporarily from the column in the stem, by shaking the instrument. An expert in this kind of work can usually detach a thread of almost any length that he pleases, whether it be long or short. The instrument is then inclined so that the detached thread may be brought into various positions in the stem; and in certain of these positions its length is observed with great care. The volume of the thread being constant, it is plain that its length will be greater where the calibre of the tube is small than it will be where the calibre is relatively large. The details of the operation of determining the calibration errors of a thermometer are very involved; but the general plan consists in observing the lengths of detached threads of mercury at different points of the stem, and then computing, from these observed lengths, the relative areas of cross-section of the stem-calibre at various points. It is then possible to calculate a table of calibration corrections, by the aid of which it will be easy to correct any given reading of the instrument, so as to find what reading would have been obtained if the stem had been of absolutely uniform calibre throughout.

Prominent among the other sources of error, there are four that merit special attention. (1) In the measurement of a temperature, the bulb of the thermometer is supposed to be fully exposed to that temperature; but since the mercury in the stem must be seen in order to be read, it often happens that the stem of an instrument is necessarily exposed to conditions of temperature that are materially different from those to which the bulb is subjected. Hence there is often a "stem error" to a thermometer, due to the fact that the mercury thread in the stem is colder (or hotter) than that in the bulb, and therefore shorter (or longer) than it really ought to be. The magnitude of this stem error will obviously vary with the conditions under which the thermometer is used. It is always very uncertain in amount, and hence it is customary, in well executed scientific work, to design the apparatus that is to be used (including the thermometer itself), with special reference to the desirability of keeping the stem error as small as possible. (2) When the barometric pressure upon the bulb of the thermometer varies, the bulb yields elastically to these variations, and often to an extent quite sufficient to influence the reading of the instrument by an amount that cannot be neglected. The error due to this cause can be determined and eliminated by means of the "external pressure coefficient," which is obtained by subjecting the thermometer, at some fixed temperature, to a known change of external pressure, and noting the alteration of the reading that this variation of pressure produces. (3) The pressure of the mercury upon the inner surface of the bulb may vary from several causes, one of which is the position of the thermometer itself. If the stem is in a vertical position, the bulb will be subjected to a pressure due to the height of the column of mercury in the stem; and when the thermometer is horizontal, this static pressure will be absent. In small thermometers the error due to this cause is unimportant; but in instruments of high precision, in which the stem may be several feet in length, it must receive due consideration. The constant which is used for correcting for this source of error, and which is to be determined by experimenting with the thermometer in different positions but at the same constant temperature, is called the "internal pressure coefficient." (4) It is found that the glass of which a thermometer is composed exhibits certain anomalies in its expansion and contraction, when its temperature is altered. These result in an apparent variation in the position of the "zero point" of the theromometer, which is very troublesome when measurements of the highest precision are to be made. It is on account of this anomalous variation in the position of the zero point that the three kinds of glass mentioned in the earlier part of this article are recommended for the manufacture of the

bulb; the variation of the zero having been studied in the case of these species of glass with great care. The phenomena as observed in the case of "verre dur" are thus described by Guillaume: "When a verre dur thermometer is quickly exposed to a temperature of 100° C., after having reposed for a considerable time at the ordinary temperature of the laboratory, its zero point falls with such rapidity that after an exposure of one minute at 100° C. the displacement is practically complete. If the thermometer is then placed in ice-water, its zero ascends, for the first few moments, at the rate of about 0.001° C. per minute; but this rate diminishes rapidly. When a thermometer is maintained at a constant temperature, its zero point rises little by little, and the change can be traced plainly for several years. For thermometers of verre dur, the gradual rise at constant temperature amounts to about 0.001° C. per month when the thermometer is two years old; and at the end of four or five years the motion is found to have diminished to about 0.0002° C. per annum." The ideal way of measuring a temperature, with a thermometer made of one of the three glasses mentioned above, is as follows: The thermometer is exposed to the temperature that is to be measured, and its zero point falls to a certain (presumably unknown) position. After the instrument has been read, it is introduced, as quickly as is consistent with its safety, into a mixture of water and pulverized ice. The mercury sinks at once, and soon attains a stable position, which, on account of the slowness of the change of zero with falling temperature, is taken to be the zero corresponding to the higher temperature to which the instrument has been previously exposed. In accordance with this plan, the temperature to be measured is found by subtracting the subsequent reading in ice-water from the reading obtained at the temperature to be determined. The method here outlined, for eliminating the effect of variations in the zero point of a thermometer, is known as the "method of movable zeros," and is now adopted at practically all of the centres of accurate thermometry except Kew, for temperatures between the freezing and boiling points. It is not yet possible, by any method of procedure, to determine temperatures more than a few degrees below the freezing point, or more than a hundred degrees (centigrade) above the boiling point, by the aid of a mercury-in-glass thermometer, with a precision comparable with that which is attainable within the fundamental interval that lies between 0° C. and 100° C.

It is to be understood that in the foregoing discussion of the errors of the mercury-in-glass thermometer, we have been treating of the determination of temperatures to such a degree of precision that the final error is not to exceed (say) 0.005° C. No such elaborate care is required, if the only object of the measurement is to determine the temperature to the nearest degree, or half-degree.

Passing now to the consideration of the ordinary thermometers that are used about the household and by amateur meteorological observers, it may be pointed out, first, that in the manufacture of a thermometer that is to be sold at retail for (say) 50 cents, it is not commercially possible to engrave a special scale for each instrument. In making cheap thermometers it is customary to stamp out the scales in large numbers, and then to blow the bulb of each instrument to such a size that the scale will be as nearly as practicable adapted to the finished thermometer. This can be done, by an experienced glass-worker, with greater accuracy than might be supposed; but it is evident that no high degree of precision can be attained in this way. The scale and the rest of the thermometer being adapted to each other as nearly as is commercially practicable, the thermometer is adjusted with respect to the scale by exposing it to some known temperature (say 70° F.) in the vicinity of the temperatures at which it is most likely to be used, and then securing it in such a position that the point on the stem to which the mercury rises comes opposite the proper mark on the scale. Such a thermometer will give readings that are not greatly in error at temperatures near the one at which it is standardized; but at other temperatures any two such thermometers will necessarily diverge by an amount which depends upon the judgment and skill of the workmen who blew the bulbs, and who endeavored to give them capacities adapted to the sizes of the degrees upon their respective graduated scales.

For further information concerning the methods that are used in precise thermometry, consult Guillaume, 'Thermometrie de Précision'; and for the historical aspect of the subject, consult H. Carrington Bolton, 'Evolution of the Thermometer.' See, also, Preston, 'Theory of Heat.')

Gas Thermometer.— A thermometer in which the temperature is measured by the change of volume, or pressure, of a mass of gas enclosed in a glass envelope. The gases that are most commonly employed for this purpose are air, hydrogen, and nitrogen; and thermometers containing these several gases are respectively called "air thermometers," "hydrogen thermometers," and "nitrogen thermometers." See THERMOMETRY.)

Alcohol Thermometer.— A thermometer in which the temperature is indicated by the expansion of alcohol (instead of mercury); coloring matter of some kind being dissolved in the alcohol, so that the column of fluid in the stem of the instrument may be distinctly visible. Alcohol has a larger coefficient of expansion than mercury, and hence, for the same sizes of bulb and stem, the degrees are longer upon a thermometer containing it. Alcohol can also be used at temperatures that are low enough to destroy an ordinary thermometer, by the freezing of the mercury. No great degree of precision can be attained with the alcohol thermometer, however, partly because the liquid wets the glass and thereby causes the instrument to read too low when the temperature is falling, and partly for other reasons. For the measurement of temperatures approaching the freezing point of mercury (37.8° F. below zero) the International Bureau of Weights and Measures prefers a thermometer filed with toluene to one that is filled with alcohol; the toluene thermometer being apparently capable of yielding much more accurate results. Owing to the fact that alcohol boils at a much lower temperature than water, the alcohol thermometer can hardly be graduated by the method given above for the mercury instrument, since exposure to a temperature of 212° F. would cause the alcohol to have a vapor pressure so high that the bulb would be likely

to burst. These thermometers are therefore graduated, most commonly, by direct comparison with a standard mercury-in-glass instrument. The expansion of alcohol by heat is not strictly proportional to that of mercury, and hence if the scale of the mercury thermometer is taken as the standard, the degree marks upon the alcohol thermometer will not be spaced at uniform intervals. These spaces are in fact smaller at low temperatures than at higher ones, as will be seen by examining any good alcohol thermometer that is adapted for observing a considerable range of temperature.

Maximum and Minimum Thermometers are thermometers which automatically record the highest or lowest temperatures to which they have been exposed during a given period. In the Rutherford maximum thermometer the capillary stem of the instrument is placed nearly horizontal, and as the mercury rises it pushes before it a tiny index of iron or steel, placed within the tube; and the index, being left at the most extreme position attained by the mercury, indicates the highest temperature to which the instrument has been exposed. In the Rutherford minimum thermometer a similar index is used, but the thermometric column is here composed of alcohol, and the index lies within the alcohol. When the temperature falls, the free end of the column of alcohol in the stem adheres to the index, and drags it toward the bulb; but when the temperature rises again, the alcohol flows around the little index (which does not fill the capillary tube), and so leaves it in the position to which it had been drawn at the moment when the temperature was lowest. In both forms of thermometer the index is returned to a suitable position for making a new observation by the aid of a small magnet. In the Negretti and Zambra maximum thermometer the capillary tube is partially obstructed near the bulb, so that although the mercury flows outward readily enough as the temperature rises, a fall of temperature at any moment causes the mercury thread in the stem to break at the obstruction, so that the maximum temperature to which the thermometer has been exposed can be read directly, in the usual manner. The broken thread can easily be returned to the partially empty bulb by jarring the instrument, or by whirling it sharply in a circle.

Clinical Thermometer.— A form of the Negretti and Zambra maximum thermometer, which is used by physicians for determining the temperature of the human body.

The graduation on these instruments is fine, so that the temperature can be read to the tenth of a degree or so; and the entire interval covered by the graduation rarely extends below 95° F., or above 115° F., the normal temperature of the body being about 98° F. In using the instrument, the bulb is placed under the patient's tongue, or in the arm-pit.

Radiation Thermometer.— A form of thermometer designed to indicate the intensity of solar or terrestrial radiation. The solar radiation instrument consists of a thermometer with a blackened bulb, the stem being sealed into an exhausted sphere of glass, so that the blackened bulb comes in the centre of the sphere. When sunlight is allowed to fall upon this thermometer, and also upon a similar one with a bulb that is silvered and polished, the black bulb absorbs most of the radiant heat, while the polished one reflects most of it. The difference in the readings of the two instruments is assumed to indicate the intensity of the radiant energy falling upon them.

Upsetting Thermometer.— A form of thermometer provided with a constriction in the stem similar to that used with the Negretti and Zambra maximum thermometer, and so designed that when the instrument is inverted the mercury thread breaks at the constriction and runs down into the stem. These instruments are graduated so as to read correctly when they are held upside down. By upsetting a thermometer of this kind by means of clockwork, the temperature that prevails at any particular hour can be recorded.

Deep-Sea Thermometer.— An instrument commonly of the upsetting type, for observing temperature at various depths in the sea. It is enclosed in a very strong case, and is reversed at the depth at which the temperature is desired. At moderate depths the reversal is effected by sending a weight down along the sounding wire; but at greater depths the upsetting mechanism is usually actuated by a small propeller which is arranged so as to begin its rotation when the thermometer starts on its return to the surface of the sea.

Registering Thermometer.— Any thermometer which automatically records its own readings.

Dew-Point Thermometer.— A thermometer adapted to the determination of the temperature at which dew will be deposited from the air. The most accurate form of the instrument is that devised by Regnault. This consists of a pair of thin receptacles of polished silver, shaped somewhat like ordinary chemical test-tubes. A thermometer is placed in each of these, and one of the tubes is then partially filled with ether, or some other volatile liquid. When a current of air is passed through the ether by means of an aspirator, the rapid evaporation cools the silver tube and its contents (including the thermometer); and the observation consists in noting the temperature of the ether, when the polished exterior of the silver tube containing it is first dimmed by the deposition of dew. The second tube of silver, which is not cooled, assists the eye in judging when the dew is first deposited upon the other one; and the thermometer that the uncooled tube contains is used merely to record the temperature of the air at the time of the experiment.

Differential Thermometer.— An instrument for measuring or detecting differences of temperature, without reference to the absolute values of the temperatures that are compared. Sir John Leslie's form, as improved by Rumford, consists of a horizontal tube, turned upward at the two ends, and there provided with a pair of equal bulbs of considerable size. The bulbs are filled with air, and a small quantity of colored liquid is placed in the horizontal tube which joins them; the liquid serving to separate the air masses that the bulbs contain, and also as an index for reading the instrument. So long as the temperatures of the two bulbs remain equal, the pressure of the air will be the same in each, and the liquid index will not move. If one of the bulbs is warmed slightly more than the other one, however, the air that it contains ex-

pands and forces the liquid index toward the cooler bulb; the amount of this displacement indicating the difference in the temperatures of the bulbs. This form of differential thermometer is not used to any great extent at the present time, the thermo-pile (see THERMO-ELECTRICITY) and the platinum resistance thermometer (see THERMOMETRY) having almost entirely displaced it.

Wet Bulb Thermometer.— A thermometer whose bulb is covered with thin wet muslin, and which is used for determining the amount of moisture in the air. In practice, the wet bulb thermometer is used in connection with a similar thermometer having a dry bulb, the two being whirled through the air together, or having a current of air directed upon them by a fan, or otherwise. The evaporation of the moisture about the wet bulb causes that instrument to become cooler than the other one; and the difference in the readings of the two thermometers, when taken in connection with the reading of the dry one, enables the observer to determine the degree of saturation of the air at the time the experiment is made. Tables for this purpose are given in Weather Bureau Document No. 235.

Weight Thermometer.— A thermometer consisting of a bulb provided with a capillary outlet in the place of the usual stem. In using this instrument, the bulb is first weighed while empty, and again when filled with ice-cold mercury. It is next heated to the boiling point of water, and the mercury which escapes from it on account of the expansion is collected and weighed. These data enable the observer to calculate the fraction of the original weight of ice-cold mercury that is lost upon heating the bulb to the boiling point. To determine any other temperature, he fills the bulb, as before, with ice-cold mercury, and then exposes it to the temperature that is to be measured (this temperature being assumed to be higher than the freezing point of water). Collecting the mercury that runs out of the bulb, and expressing its weight as a fraction of the weight of cold mercury that was present at the outset, he has only to compare the fraction so obtained with the fraction obtained in the first experiment, in order to be able to calculate, by a simple proportion, the temperature desired. The weight thermometer is not a convenient instrument to use, but it is simple in theory, and is free from certain of the errors to which ordinary thermometers are liable.

Metallic Thermometer.— An instrument in which temperature is determined by noting the change of form or of length that a metallic strip experiences when it is heated. In Bréguet's instrument, three thin strips of platinum, gold and silver are rolled together into the form of a single ribbon, the gold being in the centre. The ribbon is then coiled into a spiral, with the silver on the concave side. When one end of such a spiral is fixed, a rise of temperature causes the spiral to partially unwind, owing to the fact that the coefficient of expansion of silver is greater than that of gold, while the coefficient of gold is also greater than that of platinum. The free end of the spiral is caused to actuate a pointer, by which the temperature is indicated.

Platinum Resistance Thermometer.— An instrument for determining temperature, by noting the variation of the electrical resistance of a wire or strip of platinum. (See THERMOMETRY.)

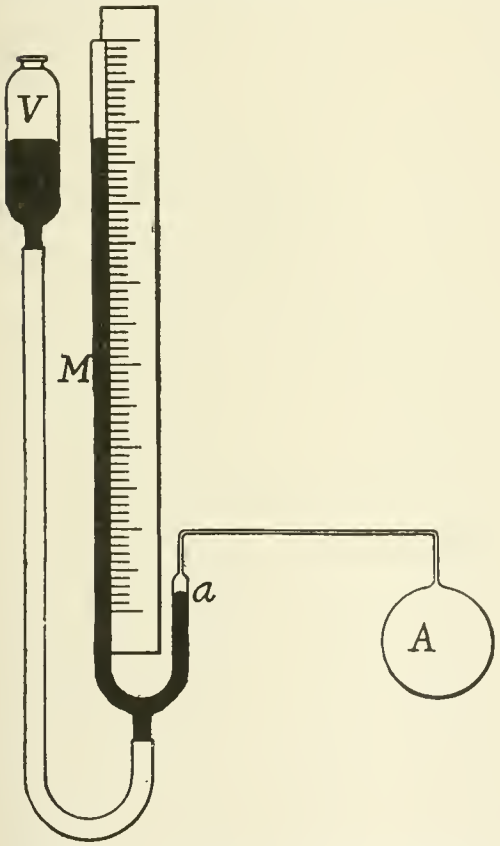
A. D. RISTEEN, PH.D.,
Editorial Staff, 'Encyclopedia Americana.'

Thermomet'ric Analysis. See CHEMICAL ANALYSIS.

Thermometry, the art of measuring temperatures. The "measurement" of temperature is quite a different thing from the measurement of a time, or a length, or a mass, and it consists merely in assigning to each temperature that may come up for consideration a definite place upon some sort of a numerical scale. The scale itself may be perfectly arbitrary, so that an interval of temperature upon one part of the scale cannot is said to be "equal," in any physical sense, to an interval on some other part, even though the two are expressed by the same number of "degrees." The chief essentials of a practical thermometric scale are (1) that it shall be perfectly definite, so that when the same temperature is "measured" on several different occasions, the same identical result will be obtained each time, at least to a degree of approximation sufficient for the purposes for which the temperature is being determined; and (2) that it shall be possible for two or more different observers, provided with distinct instruments of measurement, to measure the same temperature, and obtain results that are identical, at least to the same degree of approximation as noted above. So long as these essential conditions are fulfilled, we may make use, for the purpose of establishing a thermometric scale, of any measurable property of matter, which varies in a determinate way with temperature; the "temperature," in any such case, being defined as proportional to the attribute that is measured, or to any continuous function of that attribute. We may therefore have as many different "scales" of temperature as we please, and any one of these will be just as defensible, and just as "correct," as any other one, although no two of them will be in perfect agreement. In practice it is found that four particular kinds of thermometric scales are especially useful. These are based, respectively, upon (1) the expansion of some substance that is subjected to an unvarying pressure; (2) the increase in pressure of a gas which is kept rigorously constant in volume; (3) the variation of the electrical resistance of a conductor; and (4) the electromotive force of a thermo-electric couple (see THERMO-ELECTRICITY), one of whose junctions is kept at a constant temperature, while the other is exposed to the temperature that is to be measured. Of these four general methods, the first two have been longest and most commonly employed; and the particular instruments that have been most extensively used for putting them into practice are known respectively as the "mercury-in-glass thermometer" and as the "gas thermometer." The mercury-in-glass instrument is described under THERMOMETER, and the gas thermometer is described in the present article, below.

The gas thermometer was probably the first form of thermometer to be constructed. The mercury-in-glass instrument followed, and for many years was used almost exclusively for the measurement of temperatures, doubtless on account of its simplicity and the ease with which it can be used. But as the science of thermometry developed, an increasing refinement in tem-

perature determinations was demanded, it was found that the mercury-in-glass thermometer is liable to serious errors on account of the anomalous expansions and contractions of the glass envelope; errors which were of little or no importance when a determination of temperature to the nearest quarter of a degree or so was considered sufficiently accurate, but which were of paramount importance when it was proposed to determine a temperature to the hundredth or thousandth of a degree. The errors due to the cause in question can now be eliminated in large measure by making temperature determinations by the "movable zero" method (see THERMOMETER); but physicists nevertheless prefer to follow



the lead of Regnault, who, in his celebrated 'Fourth Memoir' (1847), recommended the employment of the gas thermometer as the standard for the establishment of the temperature scale: and the gas thermometer is still the standard in all work of high precision. The great advantage of the gas thermometer consists in the fact that the coefficients of expansion of gases are many times greater than that of mercury, and the effects of anomalous changes of size in the glass bulb are of correspondingly less importance.

The gas thermometer is made in two general forms, according as it is desired to measure the temperature by the expansion of the gas at some constant pressure, or by the increase in the pressure of the gas at some constant volume. The latter plan being the one that is now by far the commoner in accurate work, we shall describe it first, and at some length.

The constant-volume gas thermometer is shown, in its essential features, in the accompanying illustration. It consists of a bulb, A, of considerable size, which is connected, by means of a capillary tube, with a mercury manometer, M. At a there is a mark upon the tube leading to the gas bulb, and care is taken, whenever an observation of any kind is taken, to have the level of the mercury in the short arm of the manometer stand exactly at a, in order that the volume of the thermometric gas may always be rigorously the same. A movable reservoir of mercury, V, is connected with the column M for this purpose, by means of a flexible tube; so that by raising or lowering V the mercury in M may be brought to any desired level. Any gas that we please may be used in the bulb A, but hydrogen, nitrogen, and air are the ones most commonly employed. In the filling of the bulb, the most elaborate precautions are taken, not only to have the gas that is used pure, but also, and more particularly, to have it perfectly dry. For this purpose the bulb is first exhausted by the aid of an air-pump, and is heated while in the exhausted condition, and allowed to stand for a time, so that any moisture that may adhere to the walls of the bulb may be driven off and removed. The bulb is then filled with gas that has been carefully dried by calcium chloride or other drying agents, and is then exhausted again and heated; the operations of exhausting and refilling being repeated several times, until there can be no doubt about the dryness and purity of that which is finally allowed to remain. Temperature, according to this instrument, is defined as being rigorously proportional to the pressure that prevails in the bulb A, so long as the volume of the gas in the bulb remains constant. It will be observed that there is here no assumption that the thermometric gas obeys the laws of Boyle and Charles (see THERMODYNAMICS); the relation which has just been assumed being the *definition* of the term "temperature," according to the constant-volume gas thermometer. If T be the temperature as thus defined, and P is the pressure prevailing within the bulb A, then we have, from the definition of temperature, $T = CP$, where C is a constant for the particular thermometer under consideration. (It is to be observed that P is the *total* pressure to which the gas in A is subjected. It includes not only the pressure that is read from the manometer M, but also that barometric pressure that prevails at the same time in the air of the laboratory; for this barometric pressure acts upon the top of the mercury column, and it is therefore to be added to the reading of the manometer M.) To deduce the value of the constant C, we may subject the bulb A successively to the steam from boiling water, and to a mixture of ice and water, as described under THERMOMETER. The total pressure upon the gas in the bulb being noted in each case, let us suppose that it is P_0 at the freezing point, and P_{100} at the boiling point. Then the foregoing equation, when applied to these two cases, takes the following forms, respectively: $T_0 = CP_0$, $T_{100} = CP_{100}$; T_0 being the temperature of the freezing point according to the scale of this thermometer, and T_{100} being that of the boiling point. We may define either T_0 or T_{100} however we please, and then find the cor-

responding value of C; but it is desirable that the scale of the gas thermometer shall be as closely as possible like that of the ordinary mercury-in-glass instrument; and in order to fulfil this condition it is found to be best to subject the gas thermometer scale to the condition that the difference between T_0 and T_{100}, as determined by the gas thermometer, shall be numerically the same as the difference between the freezing and boiling points, on the ordinary mercury-in-glass scale. In other words, it is found to be best to have the average size of the degrees the same on the two instruments. In scientific work the centigrade scale is used in practically every instance; and if we adopt it here, we shall have the relation $T_{100} - T_0 = 100°$, if the condition just mentioned is to be fulfilled. From this and the preceding equations we easily find that $C(P_{100} - P_0) = 100°$, or $C = 100/(P_{100} - P_0)$; so that when we know the values of P_{100} and P_0 by direct observation, we are prepared to determine C at once, and hence to calculate the gas-temperature, T, corresponding to any given pressure P, by means of the relation $T = CP$. It will be seen that the zero of the gas thermometer scale does not coincide with the freezing point of water, but that it is very much lower. The gas thermometer could not give $T = 0$, for example, unless $P = 0$; that is, not unless the temperature was so low as to cause the gaseous pressure to disappear altogether. The zero point from which the indications of the gas thermometer are counted, according to the formula given above, is called the "natural zero" of the instrument; and in order to be able to compare the gas scale with the scale of the ordinary mercury-in-glass thermometer, it becomes necessary to know what the temperature of freezing water is, as read from the gas scale. To determine this, we make use of the relation $T_0 = CP_0$. Substituting in this the value of C as already found, we find that $T_0 = 100P_0/(P_{100} - P_0)$. Now the quantity $(P_{100} - P_0)/P_0$ is known as the "coefficient of expansion at constant volume" for the gas. (The name is somewhat absurd, it is true, because there is no expansion at all, if there is no change of volume; and it would be more accurate to designate this fraction as the "coefficient of increase of pressure" at constant volume.) It appears, therefore, that the temperature of melting ice, on the scale of the constant-volume gas thermometer, is numerically equal to 100 times the reciprocal of the coefficient of expansion of the gas at constant volume. Having found T_0, we have only to subtract it from every reading of the gas thermometer, in order to reduce that reading to its corresponding value as reckoned from the freezing point of water. If we call the values of $T - T_0$, as computed for any given gas thermometer, the "reduced readings" of that thermometer, then we find that the reduced readings of the nitrogen, hydrogen, air and carbon dioxid constant-volume thermometers are all nearly identical, and that they are all closely comparable with the readings of the ordinary mercury-in-glass thermometer. If two constant-volume gas thermometers be filled with the same gas in different states of density, then the reduced readings of the two are very nearly equal, but yet not necessarily identical.

The coefficients of expansion at constant volume of certain of the more important thermometric gases are given in Table I, as deduced from a careful analysis of the data given by Chappuis, Regnault, and numerous other experimenters of high standing. The values here given are believed to be superior to any that have yet been published. The "initial pressure" signifies the pressure in the gas in the thermometric bulb, when the bulb is surrounded by ice and water; this pressure being given, as the most convenient way of fixing the density for which the coefficients were determined. Two coefficients are given for air at each initial pressure, because it

I.— COEFFICIENTS OF EXPANSION AT CONSTANT VOLUME.

Gas	Initial pressure = 1,000 mm.		Initial pressure = 760 mm.	
	Coefficient of expansion	T_0	Coefficient of expansion	T_0
Hydrogen ..	0.0036624	273.04°	0.0036624	273.04°
Nitrogen ...	0.0036745	272.15	0.0036716	272.36
Carbon dioxid ...	0.0037258	268.40	0.0037106	269.50
Air	0.0036746	272.14	0.0036716	272.36
Air	0.0036720	272.33	0.0036697	272.50

appears to be impossible to decide, from the observations thus far made, which one of these values is most likely to be correct, the available measures falling into two general groups, one of which favors one of the foregoing values, while the second favors the other one. In Table I the values of T_0 are also given, for convenience of reference.

The International Committee of Weights and Measures, in consideration of the differences that exist even between the reduced readings of constant-volume gas thermometers, adopted the following standard scale for the measurement of temperature, calling it their "normal thermometric scale." The scale adopted is the centigrade scale of the constant-volume hydrogen thermometer, in which the hydrogen has a density such that its pressure, at the freezing point of water, is equal to that due to a column of ice-cold mercury, one metre (1,000 mm.) high. The temperatures are understood to be "reduced," as described above, so that the thermometer reads 0° at the freezing point and 100° at the boiling point. The ideal scale would of course be the absolute thermodynamic scale (see THERMODYNAMICS); but the corrections that are required in order to reduce gas thermometer readings to this scale are still too uncertain to be definitely adopted in precise thermometry.

II.— COMPARATIVE READINGS OF CONSTANT-VOLUME GAS THERMOMETERS AND THE MERCURY-VERRE DUR SCALE ("REDUCED" TEMPERATURES).

Hydrogen	Nitrogen (or air)	Carbon dioxid	Mercury
— 10° C.	— 10.007°	— 10.032°	— 10.077°
0	0.000	0.000	0.000
+ 10	+ 10.006	+ 10.025	+ 10.051
+ 20	+ 20.010	+ 20.043	+ 20.084
+ 30	+ 30.011	+ 30.054	+ 30.102
+ 40	+ 40.011	+ 40.059	+ 40.112
+ 50	+ 50.009	+ 50.059	+ 50.104
+ 60	+ 60.005	+ 60.053	+ 60.084
+ 70	+ 70.001	+ 70.044	.....
+ 80	+ 79.998	+ 80.031	.....
+ 90	+ 79.997	+ 90.016	.....
+ 100	+ 100.000	+ 100.000	100.000

In Table 2 comparative readings are given, of the mercury-in-glass ("verre dur"; see THERMOMETER) scale, and the scales of the constant-volume hydrogen, nitrogen and carbon dioxid thermometers, in which the "initial pressures" are 1,000 millimetres of mercury. The significance of the table will be made plain by the following example: If all of these thermometers were exposed to a temperature at which the "reduced" reading of the hydrogen instrument was 30° C., then the nitrogen thermometer would read 30.011°, the carbon dioxid thermometer would read 30.054°, and the mercury-in-glass thermometer would read 30.102°. The readings given in the second column were obtained from experiments made upon the nitrogen thermometer; but Chappuis states that the reduced readings of the air thermometer and of the nitrogen thermometer are practically indistinguishable; and hence this column will serve for each of them.

In the constant-pressure gas thermometer, temperature is defined as proportional to the volume of a fixed mass of gas which is allowed to expand in such a manner that its pressure remains constant. Regnault experimented with thermometers of this class, and considered them to be distinctly inferior in accuracy to those in which the volume is constant, and which we have already described. This judgment pronounced by Regnault has met with the approval of nearly every subsequent authority upon experimental physics, and hence the constant-pressure gas thermometer has not been at all extensively used in practical work. Professor H. L. Callendar, in fact, is almost the only prominent advocate of the constant-pressure instrument at the present time. He claims that the constant-pressure gas thermometer is capable of yielding results even superior to those of the constant-volume thermometer; and he has devised a very ingenious form of the constant-pressure instrument, which certainly appears to overcome most of the objections that have been urged against it in the past. (See his paper entitled 'On a Practical Thermometric Standard,' in the 'Philosophical Magazine,' for 1899, Vol. 48, page 519. Consult, also, 'Proceedings of the Royal Society,' Vol. 50, 1891, page 247, and Preston, 'Theory of Heat'.) To facilitate computations connected with the constant-pressure gas thermometer, we present, in Table 3, the coefficients of expansion of the principal thermometric gases at the constant pressure of 1,000 millimetres of mercury and also at 760 millimetres. These are obtained by a careful comparison of the best determinations that have yet been made, and the values here given, like those in Table 1, are believed to be the best that have been published up to the present time.

III.—COEFFICIENTS OF EXPANSION OF GASES AT CONSTANT PRESSURE.

Gas	Pressure = 1000 mm.		Pressure = 760 mm.	
	Coefficient of expansion	T_0	Coefficient of expansion	T_0
Hydrogen ..	0.0036600	273.22°	0.0036606	273.18°
Nitrogen ...	0.0036731	272.25	0.0036707	272.43
Carbon dioxid	0.0037422	267.22	0.0037247?	268.48?
Air	0.0036734	272.23	0.0036706	272.44

The coefficient of expansion of carbon dioxid at a constant pressure of 760 millimetres of mercury must be considered as still somewhat uncertain, though the value given in the table appears to be the best now attainable. The "natural zero" of the constant-pressure thermometer lies in about the same general region as the natural zero of the constant-volume instrument. The temperature of melting ice, as referred to the "natural zero" of the scales of the several constant-pressure gas thermometers, is given in Table 3, in the columns headed "T_0." No extensive and accurate comparisons have yet been made between the constant-pressure and constant-volume thermometers, either for the same gas or for different ones.

In the platinum-resistance thermometer, temperature is defined as proportional to the electrical resistance of a coil of pure, annealed platinum wire. The "thermometer" itself consists of a coil of the wire, wound upon a sheet or strip of mica, and placed in one of the arms of a Wheatstone's bridge, so that its resistance may be accurately determined. It is usual to denote a temperature as defined by the platinum-resistance thermometer by the symbol "pt" ("platinum temperature"). We have, therefore, $pt = CR$, where R is the observed resistance of the coil at the temperature denoted by pt and C is a constant whose value is to be determined. If R_0 and pt_0 and R_{100} and pt_{100} are the respective resistances and platinum-resistance temperatures at the freezing and boiling points of water, then we have, precisely as in the case of the constant-volume gas thermometer, $pt = 100R/(R_{100} - R_0)$, as the platinum-resistance temperature, as reckoned from the "natural zero" of the platinum-resistance thermometer. The "reduced platinum temperature," obtained by subtracting pt_0 from the temperature pt as here computed, is the one that is commonly used, however; and Callendar and Harker and Chappuis have shown that the reduced platinum-temperature can be expressed in term of the reduced gas thermometer scale by means of a simple equation of the form:

$$pt = T + A.\frac{T}{100}\left\{\frac{T}{100} - 1\right\}$$

A being a constant whose value is to be determined experimentally. Callendar and Griffiths, for the purpose of determining A, recommend that the resistance of the platinum coil of the thermometer be observed at the temperature of boiling sulphur; the "reduced temperature" of this boiling point being, according to their experiments with the constant-pressure air thermometer, 444.53° C. The platinum-resistance thermometer gives great promise of being a highly valuable instrument in the future. Indeed, it is so already; but it does not yet appear to be capable of determining the absolute values of temperatures closer than to 0.01° C. It may be used as a differential thermometer, however, so as to give results of a far higher order of accuracy. For this purpose two similar coils or strips of platinum are used, these being placed in two of the arms of a Wheatstone's bridge, so that the smallest departure from equality in their resistances can be observed. (See RESISTANCE, ELECTRICAL.) Langley's bolometer is an instrument of this sort. It is used to explore the solar spectrum, and consists of two strips of platinum foil, which are placed across the spectrum to be

examined, with their edges toward the source of the light. The two strips are placed in the two arms of a sensitive Wheatstone's bridge, and so long as both the strips are exposed to radiation of the same intensity, the balance of the bridge is preserved. When one of the strips coincides with a Fraunhofer line, however, while the other is still exposed to the full radiative power of the source of light, the balance is destroyed, and the existence of the line is thereby demonstrated, even though the line be in the infra-red, where it is not visible to the eye.

Thermo-electric couples have been used to a considerable extent for the measurement of temperature, and Regnault experimented with them somewhat, but showed that they are distinctly inferior in accuracy to the other known methods of determining temperature. At exceedingly low temperatures, however, they are often of great value. Wroblewski, for example, made use of thermo-couples quite extensively for temperature measurements in his researches on the critical points of the gases which are liquefiable only at extremely low temperatures. The platinum-resistance thermometer is more generally favored, however, for this purpose.

Consult Guillaume, 'Thermometrie de Précision,' and Preston, 'Theory of Heat,' together with the references therein given.

A. D. Risteen, Ph.D.,
Editorial Staff, 'Encyclopedia Americana.'

Thermophone, a different platinum-resistance thermometer (see Thermometry), in which the galvanometer that is most commonly employed is replaced by a telephone. Two coils of platinum wire, which are exposed to the respective temperatures that are to be compared, are introduced into two of the arms of a Wheatstone's bridge whose remaining arms contain known resistances. The telephone is placed in the cross-arm of the bridge. An alternating or pulsating current of low frequency is used in making the observation, and when the bridge is in balance, this fact is indicated by the silence of the telephone. See Warren and Whipple, 'The Thermophone,' in 'The Technology Quarterly,' Vol. VIII., page 125.

Thermopylæ (Gk. *Θερμοπύλαι*, hot gates), or simply *Pylæ* (Gk. *Πύλαι*, gates), in classical geography, a pass on the southeastern frontier of Æniania, Greece, leading from Thessaly into Locris, and on the route of the only good road from Thessaly to central Greece. It was situated between the range of Mount Œta and an inaccessible morass which bordered the Maliac Gulf; and in breadth it was a narrow tract of perhaps some 50 feet. Its name was derived from the presence of thermal springs. As the only means by which a hostile army might penetrate from northern into southern Greece, it held a peculiar strategic value in Grecian history. It is celebrated as the scene of the defense by Leonidas (q.v.) and the 300 Spartans against the vast host of Xerxes (q.v.) in August 480 B.C. The account of this battle given by Herodotus has been generally followed. Xerxes, ridiculing the members of the Hellenic defenders (5,200, not counting the Locrians, whose numbers are not known), sent against them the Medes and Cissians with instructions to take them prisoners and bring them before him. When, after a day's fighting, these were unsuccessful, the picked 10,000, called the "Immortals," were sent forward; but, handicapped by the shortness of their spears, they were no match for the Hellenes, of whom few fell, while the Persian loss was on both days excessive. Xerxes was now in great perplexity, when Ephialtes, a Malian, came "to tell him of the pathway which led across the mountain to Thermopylæ." This path ascended the gorge of the river Asopus, and the hill Anopæa; then passed over the crest of Œta and to the rear of Thermopylæ. The Persians arrived in the rear of Thermopylæ soon after mid-day of the third day. Tidings of their coming had already been brought to the Greeks by scouts and Persian deserters. Most of the Greeks withdrew, but the Spartans and the Thespians (700) remained, and the Thebans (400) were compelled to stay. Of the Spartans and Thespians, all fell; and of the Thebans, few escaped. To the complaint that the Persian arrows darkened the sky the Spartan Dieneces is said to have answered, "Good; then we shall fight in the shade."

Through deposits from the Spercheius and other streams, great alterations have taken place at Thermopylæ, so that it is not now a pass, but a swampy plain. Consult Schliemann, 'Untersuchungen der Thermopylen' (1883), and various standard histories of Greece. See also Greece, Ancient — *History*.

Thermopylæ of America, a title applied to Fort Alamo, Texas. See Alamo, The.

Thermoscope (Greek, "to show heat"), any instrument for indicating temperature. The term is commonly applied, however, to such instruments as indicate one temperature only, or a very limited number of temperatures; or to those which are used for indicating changes or difference of temperature, without giving the magnitude of these changes or differences. The forms that have been given to instruments of this kind are so manifold as to be almost past enumeration. As a single illustration, the instrument may be cited, whose indications depend upon the melting points of alloys. An instrument or device of this sort contains buttons or wires of a number of alloys, whose several melting points are known; and in the observation of temperature by this method, the instrument is exposed to the temperature under examination, and a note is made of which of the alloys melt, and of which remain unmelted. If T_1 is the melting point of the least fusible of the alloys that have melted, and T_2 is the melting point of the most fusible of the alloys that have not melted, we can then assert that the temperature under consideration is higher than T_1, but lower than T_2. For many purposes in the arts, it is quite sufficient to know, in this manner, that a temperature is between certain limits. A thermoscope which can only indicate certain limits between which a temperature lies, is called a "discontinuous thermoscope." Continuous thermoscopes, which are capable of affording an actual measurement of any temperature within their range, are now commonly called "thermometers," whether they resemble the ordinary mercury-in-glass thermometer or not. A thermoscope in which temperature is inferred by noting the electrical resistance of a coil of platinum wire, for example, is called a "platinum resistance thermometer." See Thermometer and Thermometry.

Ther'mostat. See ELECTRIC ALARM; ELECTRIC SIGNALING.

Thermotax'is, the regulation of the temperature of the body. The principal sources of animal heat are muscular exercise and the combustion of food, involving absorption of oxygen and liberation of carbon dioxide. Body temperature remains about normal under many trying circumstances through the balance maintained by the nervous system between its production and its dissipation. The chief avenues of dissipation are radiation from the surface of the body, the expired air, and the excreta. Febrile action or fever is believed to be due to an overproduction of heat, to an underelimination, or to both. The overproduction is believed to result from an increased combustion especially of albuminous substances of the body, with an increased discharge of carbon dioxide and the nitrogenous wastes, urea, creatine, and creatinine. When fever prevails the action of the heart is accelerated, the secretions of glands are impaired, and the intricate process of metabolism is deranged. Heat-regulation, effected by reciprocal changes in heat-production and heat-dissipation and depending essentially upon the influence of cutaneous impulses and the temperature of the blood, is governed, it is generally believed, by two nerve-centres, one controlling heat-production, the other heat-dissipation.

Thermot'ropism, a tendency toward warmth, exhibited in the reactions of animals. An example is found in the care with which ants move their eggs and larvæ from place to place in order to secure a proper and equable temperature for their welfare. Compare HELIOTROPISM, with which tendency this is somewhat confused.

The'roid, having animal propensities or characteristics; specifically applied to idiots, who in habits or appearance resemble any of the lower animals. The word is of recent introduction, but the extraordinary resemblances presented by some of the weak-minded to certain birds and mammals have attracted attention for a very long period.

Theromor'pha, or Anomodontia, an order of extinct (Triassic and Permian) reptiles. "The dominant group among the earliest reptiles in each quarter of the globe where they have as yet been discovered," says Woodward, "is directly intermediate in skeletal characters between the highest labyrinthodonts (*Mastodonsaurus* and its allies) and the lower mammals (*Monotremata*). Its members first received the name *Anomodontia* in allusion to the varied modifications of the dentition, so unusual among reptiles. They were afterward named *Theromorpha* or *Theromora* . . . in allusion to the many obvious resemblances in their skeleton to that of monotreme mammals." These similarities are chiefly of the dentition, zygomatic arch, pelvis, cruro-tarsal joint, scapula and occasional doubling of the occipital condyle. The general shape of the skull is often closely mammalian, but its details show its unquestionable reptilian features. Three suborders are recognized — *Parciosauria, Theriodontia,* and *Anomodontia.*

The theromorphs were all land-reptiles with short, stout limbs and powerful jaws. Some were massive and of great size, like great alligators with turtle-like or even dog-like heads; others small and probably as agile as a weasel. They were the predatory beasts of their age, and were adapted in powers and characteristics to the pursuit of a large variety of animal prey. The most unreptile-like were those of the suborder *Theriodontia* (q.v.).

It is a natural suggestion that the race of mammals, undoubtedly of reptilian origin, must have descended from this group, whose bones (numerous in the Triassic rocks of the Western United States) show so many mammalian features; but thus far no direct connection can be shown. The dinosaurs, however, seem certainly to have descended from this stock. Consult Woodward, 'Vertebrate Palæontology' (London 1898); Gadow, 'Amphibia and Reptiles' (New York 1901), wherein many further references to details will be found.

Therop'oda, a sub-order of dinosaurs (q.v.).

Thersites, thĕr-sī'tēz, according to Homer, the ugliest man in the whole Grecian army that beleaguered Troy. He was a malicious and slanderous brawler whom Ulysses publicly beat and brought to tears for his insulting attack on Aganon. He was eventually slain by Achilles for piercing with his spear the eye of the dead queen of the Amazons, Penthesilea, whom he had also spoken of with contumely.

Theseum, thē-sē'ŭm, or **Theseion,** thē-sē'ŏn, a temple in ancient Athens dedicated to the commemoration of Theseus and his exploits. It stood on an elevated site northwest of the agora and in early Christian times was used as the church of Saint George of Cappadocia. Within its precincts Cimon deposited the bones of the hero which he had brought from the island of Scyros. The temple was begun 465 B.C. Many consider it to have been originally dedicated to Heracles or Hephæstus, but there is no reason to doubt that it is actually a Theseum. It was constructed of Pentelic marble in the purest Doric style and is technically to be described as an amphiprostyle, hexastyle peripteral temple, with pronaos, and opisthodomos or epinaos. The façade and rear pediment have each six columns; the sides 13 each; their height being about 30 feet. A fragment of the portico and the roof of the stella are still standing. There are also some noteworthy remains of the statuary with which the building was adorned by sculptors of the school of Phidias. On the metope are set forth the exploits of Theseus and Heracles and the frieze of the cella is also in part standing. The dimensions of the building are roughly to be estimated at 100 x 50 feet. Consult: Stuart and Revett, 'Antiquities of Athens' (1816); Leake, 'Topography of Athens'; Dyer, 'Ancient Athens, Its History, Topography and Remains' (1873).

Theseus, thē'sūs or thē'sē-ŭs, in Greek legend, a king of Athens and national hero of Attica, son of Ægeus by Æthra, the daughter of Pittheus of Troezen, in Peloponnesus. He was educated at Troezen, at the house of Pittheus, and passed for the son of Poseidon (Neptune). When he came to years of maturity he was sent by his mother to his father, and a sword and sandals were given him by which he might make himself known to Ægeus (q.v.) in a private manner. On arriving at Athens he narrowly

escaped being poisoned by Medea, but his father recognized the sword, and received Theseus as his successor on the throne. He next caught alive the wild Marathonian bull; but a much more important service was the slaying of the Minotaur and the freeing of Athens from the tribute of seven youths and seven maidens annually sent to Crete to be devoured by that monster. (See MINOTAUR.) He succeeded his father as ruler of Athens. The Athenians were governed with mildness, and Theseus made new regulations and enacted new laws. The number of the inhabitants of Athens was increased; a court was instituted, which had the care of all civil affairs; and Theseus made the government democratic, while he reserved for himself only the command of the armies. To him also the Athenians ascribed the union of the towns of Attica into a single state, with Athens at the head, and the division of the people into the three classes of Eupatridæ, Geomori, and Demiurgi (nobles, husbandmen, and mechanics). Perhaps the most celebrated of the events in the career of Theseus after the slaying of the Minotaur was his war with the Amazons. He is said to have invaded their territory and carried off their queen, Antiope (according to another account, that with which the readers of Chaucer and Shakespeare are familiar, Hippolyta). The Amazons in their turn invaded Attica, and a battle was fought in the city of Athens itself. Theseus was victorious, and the Amazons driven out of Attica. He was absent from Athens on various expeditions, and when he returned the Athenians had forgotten his services. He retired to the court of Lycomedes, king of Scyros, who threw him down a deep precipice. In 469 B.C. his bones, as supposed, were found by Cimon in Scyros, and brought to Athens, where they received a magnificent burial. Statues and a temple (the Theseum) were raised; and festivals and games were publicly instituted to commemorate his actions. A portion of the temple still remains standing. What shreds of history, if any, there may be in the accounts of Theseus cannot be ascertained.

Thesmopho'ria, a pagan festival of ancient Greece. It was celebrated only by women, in honor of Demeter Thesmophoros ("the lawgiver") as foundress of agriculture, and thereby of orderly social life and the marriage. At Athens the festival extended to three days, beginning with 24 October. On the first day there was a procession to the temple of Demeter at Halimos, southeast of the city; on the second a fast; and on the third day, called Kalligeneia ("the bearer of a fair offspring"), general and often licentious indulgence.

Thesmothete, thĕs'mō-thēt (from a Greek word meaning lawgiver), one of the six inferior archons at Athens who presided at the election of the lower magistrates, received criminal informations, decided civil causes, took the votes at elections, and performed other duties.

Thes'pis, Greek author. He was a native of Icaria, a deme of Attica, lived in the time of Solon, in the 6th century B.C., and is considered the inventor of tragedy, as he added to the dithyrambic choruses of the feats of Bacchus an actor, who, when the chorus was silent, generally recited a mythical story; and probably carried on dialogues with the leader of the chorus, appearing successively in different characters in a piece. This was a decided step toward the drama.

Thessalo'nians, Epistles to the. Two epistles written by the apostle Paul to the church at Thessalonica, and which, in the Authorized Protestant Version, have notes appended stating that they were written from Athens. The prevalent opinion, however, is that the epistles were written from Corinth, as Corinth was the only place where Paul made a prolonged stay while he was accompanied by Silas and Timothy, as the opening verse of both epistles indicates that he was at the time of their writing. The date of the epistles lies most probably between 52 and 54. They are the earliest of Paul's writings; and when compared with his other epistles are seen to be characterized by greater simplicity of style, as manifested in the connection of the thoughts, the structure of the sentences, and the mode of expression. The contents of the first epistle are chiefly words of encouragement to the infant church, commendations of the zeal they had hitherto shown, mingled with exhortations to steadfastness and warnings against the danger of relapsing into the practices that prevailed among them before they joined the Christian Church. The epistles conclude with the special injunction of various Christian duties. The second epistle, after some expressions of consolation to the Thessalonians on account of the persecutions they had had to suffer, goes on to disabuse their minds of the belief that they seem to have entertained, and partly to have derived from St. Paul's own words in the first epistle (ch. iv. 15–v. 3), that the day of judgment was then imminent, on which account some among them appear to have neglected their ordinary duties. The apostle rebukes those who have been doing so, and exhorts them all to work patiently and diligently as he had done while among them, and not to be led away by busybodies.

Thes"saloni'ca. See SALONICA.

Thessaly, thĕs'ą-lĭ, or **Thessa'lia,** the northeastern division of ancient Greece proper, bounded on the north by the Cambunian Mountains, separating it from Macedonia; on the west by the chains of Pindus and Tymphrestus, separating it from Epirus; on the south by Mount Œta, separating it from Ætolia, Doris, and Locris; and on the east by the Ægean Sea. The rich plain enclosed between these mountains belongs almost entirely to one river basin, that of the Peneios (Salambria), which traverses it from west to east, and finds an outlet into the Thermaic Gulf through the vale of Tempe. It was especially famed for its fine breed of horses and its skilful horsemen. The name of Thessaly was derived from the Thessali, a Greek people who are said to have come into this land from the west, and who became the governing class in the country. Thessaly was broken up into separate states loosely united under a tagus, and long exerted no important influence on the affairs of Greece generally; but it rose for a brief period to a position of greater consequence when (about 375 B.C.) Jason of Pheræ, having been elected tagus, brought the whole of Thessaly completely under his power, and began to threaten the rest of Greece, but the confederacy was again weakened after his assassination in

370 B.C. Thessaly afterward became dependent on Macedonia, and finally was incorporated with the Roman empire. In 1393, after the fall of the Byzantine empire, Thessaly came, with the rest of the imperial dominions, into the hands of the Turks, and till recently formed a part of the Ottoman empire. The greater portion of it was in 1881 incorporated in the kingdom of Greece, being now divided into the nomes of Karditsa, Magnesia, Trikala, and Larissa.

Thetis, thē'tĭs, in Greek mythology, a daughter of Nereus and Doris, therefore one of the Nereids. Her nuptials with Peleus were celebrated on Mount Pelion, and were honored by the presence of all the gods except Eris or Discord, who was not invited, and who, to avenge the slight, threw in among the company the apple of discord. By Peleus she became the mother of Achilles (q.v.).

The'urgy, from the Greek *theourgia,* meaning divine work, and used among the ancients to signify supernatural agency in individual human affairs, or in the government of the world. Hence the act or art of invoking deities or spirits, or by their intervention conjuring up visions, interpreting dreams, receiving or explaining oracles, etc.; the power of obtaining from the gods, by means of certain observances, words, symbols, or the like, a knowledge of the secrets which surpass the power of reason, to lay open the future, etc. The word also means that species of magic which more modern professors of the art allege to produce its effects by supernatural agency, as contradistinguished from natural magic. Also a system of supernatural knowledge or power believed by the Egyptian Platonists to have been divinely communicated to a hierarchy, and by them handed down from generation to generation.

Theuriet, tē-rē-ā, **Claude André,** French poet and novelist: b. Marly-le-Roi 8 Oct. 1833. He studied law in Paris, received his licentiate in 1857, and in that year entered the department of the Ministry of Finance. His poems include: 'Le chemin des bois' (1867); 'Le bleu et le noir' (1873); 'Nos oiseaux' (1886); and 'La ronde des saisons et des mois' (1891). He also published 'Jules Bastien-Lepage, l'homme et l'artiste' (1885), but is best known by his novels, among which are: 'Nouvelles intrines' (1870); 'Mlle. Guignon' (1874); 'Channe dangereux' (1891); 'La Chanoinesse' (1893); etc.

Thian-Shan (tē-ăn' shän') **Mountains,** Central Asia. See TYAN-SHAN.

Thibault, tē-bō, **Jacques Anatole** (ANATOLE FRANCE), French novelist and poet: b. Paris 16 April 1844. The son of a librarian, he himself after finishing his studies at the Stanislaus College in 1876, became attached to the library of the Senate. He has contributed to leading French journals and after the withdrawal of Jules Claretie from the 'Temps' to become administrator of the Comédie Française, he supplied the place of the latter and contributed to that paper a weekly chronicle under the title 'La Vie littéraire.' His first publication was a life of Alfred de Vigny (1868); then followed 'Poèmes dorés' (1873) and 'Noces corinthiennes' (1876), poems afterward collected into one volume with additions in 1897. His earliest attempts at fiction were 'Jocaste' and 'Le Chat maigre' (1879). His next novel, 'Crime de Sylvestre Bonnard' (1881) was crowned by the Académie Française. Other works are 'Désirs de Jean Dervieu' (1882); 'Livre de mon ami' (1885); 'Nos enfants' (1885); 'Balthazar' (1889); 'Thais' (1890), from which an opera was made by Massenet in 1895; 'Opinions de Jérôme Coignard' (1893); 'L'Etui de nacre' (1894); 'Rotisserie de la reine Pedauque' (1895); 'Puits de Sainte-Claire,' containing 'Procureur de Judée' and 'Jardin d'Epicure' (1895); 'Lys rouge' (1896); 'L'Orme du Mail' (1897); 'Mannequin d'Osier' (1898); 'L'Anneau d'Amethyste,' 'Clio' (1899). In his fiction the critical spirit introduced into French literature by Renan finds its development. His analysis of passion is delicate; and passes from a tone of mild irony into one of bitterness. He exhibits various phases of skepticism, and in 'Jérôme Coignard' it has been said that no one since Montaigne has been so radical. To him criticism is the highest development of literary expression. "It proceeds from philosophy and history, and demands for its development an absolute intellectual liberty."

Thibaut, tē-bō, or **The'obald I.,** king of Navarre: b. France about 1200; d. 1253. He was educated at the court of Philip Augustus. As the Count of Champagne he is said to have been a lover of the queen of Louis VIII., whose death in 1226 Thibaut was suspected of having caused. He succeeded to the throne of Navarre on the death of his uncle, Sancho the Strong, in 1234. Going in 1239 to Palestine, he suffered defeat at Gaza. He left a reputation in literature as a trouvère whom even Petrarch and Dante, and other great poets praised. His poems, first published in 1742, have appeared in several later editions. Consult Delbarre, 'Vie de Thibaut' (1850).

Thibet, tĭ-bĕt'. See TIBET.

Thibodeaux, tēb-ō-dō', La., town, parish-seat of Lafourche Parish; on Bayou Lafourche, and on the Southern Pacific railroad, about 50 miles west by south of New Orleans and 60 miles south by east of Baton Rouge. It is in an agricultural region in which the principal products are rice, sugarcane, and cotton. The industries are connected chiefly with the cultivation and shipment of cotton, rice, sugarcane, and vegetables. There are several private schools, among them Mount Carmel Academy. The state bank has a capital of $25,000. Pop. (1890) 2,078; (1900) 3,253.

Thickhead, a South American caterpillar-eating bird of the family *Capitonidæ,* so named because of the full-feathered and apparently excessive size of the head. The family is a large and handsome one, closely allied to the puff-birds, and sometimes united with them under the general term "barbet." In other parts of the world "thickhead" is applied to various other birds (especially in South Africa to the stone-curlew (*Œdicnemus*) of that region, translating the local Dutch name *dikkop.*

Thief, one who steals or is guilty of theft; one who takes the goods or personal property of another without his knowledge or consent, and without any intention of returning it; one who deprives another of property secretly or without open force, as opposed to a robber, who uses open force or violence. A burglar is a thief who forces an entrance into a building.

Thierry, tī-ĕr'ī (Fr. tē-ā-rē), **Amédée Simon Dominique**, French historian and politician: b. Blois 2 Aug. 1797; d. Paris 26 March 1873. As a young man he entered the service of the minister of marine, and in 1828 became professor of history at Besançon. His ideas being ultra-liberal, his course was suspended by the minister of public instruction. In 1830 he became prefect of the department of Haute-Saône, and in 1838 returned to Paris, where he was appointed master of petitions addressed to the council of state. He held various other political appointments; but continued his historical investigations in the special field he had chosen: the origins of French national history; the early peoples and the neighboring races; and the conquest of the Gauls by the Romans. In 1841 he was elected a member of the Institute; in 1860 he became a senator; and in 1868 he received the cross of the Legion of Honor. His works include: 'Histoire des Gaulois' (1828); 'Histoire de la Gaule sous l'administration romaine' (1840–7); 'Histoire d'Attila' (1856); 'Tableau de l'empire romaine' (1862); 'Récits de l'histoire romaine au Ve siècle' (1860); and 'Saint-Jérôme' (1867).

Thierry, Jacques Nicolas Augustin, French historian: b. Blois 10 May 1795; d. Paris 22 May 1856. He was educated in the Normal School at Paris in 1811, and in 1813 became teacher in a provincial school. The following year he quitted this occupation and returned to Paris, where he embraced the socialistic views of Saint Simon, and became his secretary and his coadjutor in literary work, and in 1816 published a treatise of his own, 'Des Nations et de leurs Rapports Mutuels.' Perceiving the theoretical vagaries of his master, he separated from him in 1817, and became one of the conductors of the journal 'Le Censeur Européen.' Shortly afterward he became a contributor to the 'Courrier Français,' in which, in 1820, he published ten letters on the history of France, which attracted attention. His celebrated work on the Norman conquest of England, 'Histoire de la Conquête de l'Angleterre par les Normands,' was published in 1825, and by the interest of the narrative, brilliance of style, and novel mode of treating the subject, attained great success both in France and in England. From his close application to work M. Thierry became in the following year almost entirely blind, and at the same time was attacked by a nervous disorder, but still pursued his literary labors. An enlarged edition of the letters formerly written by him for the 'Courrier' appeared in 1827, under the title of 'Lettres sur l'Histoire de la France.' In 1830 he was elected a member of the Academy of Inscriptions and in 1834 published 'Dix Ans d'Etudes Historiques.' About this time he was entrusted by Guizot, then minister of public instruction, with the editing of the 'Recueil des Monuments Inédits de l'Histoire du Tiers-Etat,' for the collection of documents relative to the history of France. To this publication he prefixed an 'Essai sur l'Histoire de la Formation du Tiers-Etat,' separately published in 1853. In 1840 he published 'Récits des Temps Mérovingiens,' which gained for him the Gobert prize of the Academy of Inscriptions.

Thiers, tē-ār, **Louis Adolphe**, French statesman and historian: b. Marseilles 15 April 1797; d. Saint Germain, Paris, 3 Sept. 1877. He studied law at Aix, and was admitted to the bar there in 1818. Desirous of a larger theatre for his ambition he went to Paris in 1821, and having got an appointment on the staff of the 'Constitutionnel,' then the leading Parisian journal, he soon attracted attention by his articles in that paper. Journalism soon ceased, however, to supply sufficient stimulus to his active intellect, and he undertook his 'Histoire de la Révolution française,' having as colleague Felix Bodin, whose name appeared with his in the first two volumes. The work was completed in ten volumes in 1827. On the formation of the Polignac cabinet, Thiers founded with Armand Carrel and Mignet, the 'National,' whose first number appeared on 1 Jan. 1830. The new democratic organ exercised a decisive influence on public opinion, and the famous ordinances, the signal for the revolution of July, were now issued. Upon this Thiers counseled the issuing by the journalists of a revolutionary manifesto. It was signed by 43 names. To escape arrest Thiers fled, on the night of the 28th, to the neighborhood of Saint Denis, accompanied by Mignet and Armand Carrel. Louis-Philippe, becoming king of the French, Thiers was soon made councillor of state and attached to the department of finance. He was elected deputy for Aix, and after the death of Casimir Périer became minister of the interior in the cabinet of Soult, October 1832. He next filled the offices of minister of commerce and minister of public works, and again became minister of the interior, but in consequence of differences with Soult and Gérard gave in his demission 11 Nov. 1834, but soon resumed office under Mortier. He again retired in February 1836, but a few days after returned to power as foreign minister and president of the council. These offices, after many vicissitudes, he again held in March 1840. Taking a strong interest in the Eastern question he declared in favor of Mehemet Ali of Egypt against Turkey; but neither the king nor the chambers wished to resort to extremities, and the policy of Thiers having received a grave check he retired from the cabinet 29 Oct. 1840. He now devoted himself to historical pursuits, and his 'Histoire du Consulat et de l'Empire,' begun in 1845, was completed in 1862, in 20 volumes. The revolution of February, 1848, found him prepared to accept the republic; and he was a member, first of the Constituent and then of the National Assembly. After the *coup d'état* of 1851 he was banished from France, but returned in August, 1852. After an absence of 12 years from public life he was chosen in the elections of 1863 deputy for the department of the Seine, and re-elected in 1869. In this position he regained much of his early popularity. He combated energetically the project of war against Prussia, because France was unprepared, and after the disaster of Sedan visited the courts of London, Vienna, Saint Petersburg, and Florence to seek assistance against Prussia, but all that he could obtain was a promise that the four great powers would support the proposal of an armistice. Thiers accordingly proceeded to the headquarters of the King of Prussia at Versailles to open negotiations for peace. But he was unsuccessful, and Prussia proceeded to a war *à outrance*. On 17 Feb. 1871 he was elected chief of the executive power of the republic, and on the 21st opened

negotiations with Bismarck, which resulted in the peace with Germany. On 31 August the title of president was bestowed upon him and his term of office fixed at three years. He resigned 24 May 1873, whereupon Marshal MacMahon was appointed president. When MacMahon began to put himself in opposition to the republic, Thiers acted in complete harmony with the republican chiefs of the two chambers, notably with M. Gambetta, to whom, on 3 Sept. 1877, he gave a meeting at Paris to read to him, and to several other politicians, a manifesto which he had just completed. But that very day he was attacked with congestion of the brain, and died at night. Thiers was *par excellence* the representative of his country; a witty writer; and an accomplished debater. He was also genial, unselfish, large-hearted; and to establish the glory of France was the main secret of his measures and counsels.

Besides the works already named Thiers was the author of 'Histoire de Law' (1826, English trans. 1859); 'De la Propriété' (1848); 'L'Homme et la Matière' (1875). Consult Mazade, 'M. Thiers: cinquante années d'histoire contemporaine' (1884); Simon, 'Thiers, Guizot, Rémusat' (1885); Rémusat, 'A. Thiers' (English trans. 1892).

Thieves' Islands. See LADRONES.

Thimble, a small metallic sheath or cap used to protect the end of the finger in sewing. Seamstresses use a thimble having a rounded end. Those used by tailors are open at the end. In the manufacture of thimbles coin silver is mostly used, generally silver dollars, which are melted, and cast into solid ingots. These are rolled into the required thickness, and cut by a stamp into disks of any required size. A solid metal bar the size of the inside of the intended thimble, moved by powerful machinery up and down in a bottomless mold of the size of the outside of the thimble, bends the circular disks into the thimble shape as fast as they can be placed under the descending bar. The work of brightening, polishing, and decorating is done on a lathe. Thimbles are said to have been found at Herculaneum, and were used by the Chinese at a very early period. Their invention in Europe is traditionally ascribed to Nicholas van Benschoten, of Amsterdam, in the 17th century. In mechanics, the name thimble is applied to various fixtures, such as a tubular lining through which a bolt passes, etc.

Thimble-eye, a fish, the chub-mackerel (q.v.).

Thimble Rig, or **Shell-game,** a sleight-of-hand or gambling trick, performed by means of three thimbles and a pea or three nut shells and a small wooden tube or box. The pea being placed on a table and covered with one of the thimbles, the performer proceeds to shift the thimbles, covering the pea now with one, now with another, and offers to bet any bystander that no one can tell under which thimble the pea is. The person betting is seldom allowed to win, the pea being abstracted by sleight of hand. In the United States the trick is commonly known as the shell-game and is frequently played at race track meetings, rural fairs and other gatherings.

Thionville, tē-ôñ-vēl, or **Diedenhofen,** dē'-dĕn-hō-fĕn, Germany, in Alsace-Lorraine, an important railway centre, 18 miles north of Metz. It stands in a level plain on the Moselle River, and is strongly fortified. Its manufactures comprise gloves, thread and nets; and there are sawmills and tanneries. There is some trade in corn, hemp, and flax. An important fair is held annually. In the Franco-German war (q.v.), Thionville was invested after the battle of Gravelotte, and after the fall of Metz it was besieged with vigor. On 25 Nov. 1870, it was occupied by the Germans. It suffered severely by the siege. Pop. (1900) 10,060.

Third Estate. See TIERS-ETAT.

Third Order. See TERTIARIES.

Third-rail System, in electric railway construction, a method of supplying trains on an electric railway with current sent through a third rail. In starting a train of five cars by electricity from 500 to 1,200 amperes are required. If such currents were passed through a trolley wheel, very excessive arcing would be caused, due to the fact that the wheel touches the wire at only one point. The contact surface is not sufficient to carry this current, and burning of the wheel and trolley wire result. With a sliding shoe, however, instead of a single point of contact, you have a surface about six inches long by two inches wide, and two of these in use at once under normal conditions. In other words, the third-rail system differs from the ordinary trolley road only in detail. These details, however, are such as to make possible the application of electric traction to heavier trains than has been found practicable with the overhead trolley, and the system has thus broadened the field for the application of electricity to railway work, so as to bring it into successful competition with steam for the heaviest classes of service. The reasons for its general adoption on elevated roads were on account of the advantages peculiar to electric traction itself, namely:

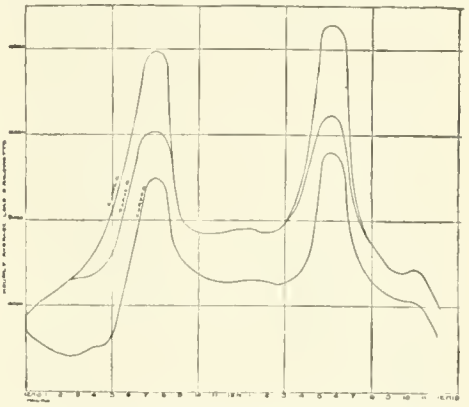


FIG. 1.— Diagram showing typical load carried at power house of Metropolitan Elevated Railway, Chicago, for 24 hours.

1. Reduction in cost of power for handling trains.
2. Increase in passenger handling capacity.
3. A service more attractive to the public generally.

The reduction in the cost of power is obtained largely from the generation of power in a single central steam plant, instead of a great number of smaller plants, as with the steam locomotive system. On this point of economy, the fuel bill is one of the large items in the oper-

ation of a railroad. With steam locomotives, such as were formerly used on the Chicago elevated roads, the only fuel available cost in the neighborhood of $3.50 to $5.50 per ton, whereas, in the modern power house, designed for electric railway systems, coal ranging from $1.25 to $1.75 a ton is burned with entire success. When to this is added the enormous loss in radiation from a large number of steam locomotives, exposed as they are in running over the line of the road, and we compare this with the relatively small loss experienced with a well-constructed stationary boiler plant, it is not surprising that the cost for coal per car mile on the electric railways in Chicago is about one third the cost per car mile with steam locomotives. The comparison is particularly favorable in Chicago on account of the ability to obtain a very cheap grade of coal directly from the Illinois and Indiana coal fields. In New York and other eastern cities, this difference is not so great, as coal delivered at those points is necessarily higher in price on account of larger freight charges. Besides the saving in the coal bill, there is a further gain by the use of large compound-condensing engine units. These large steam units having a comparatively steady load, develop power with a very much lower steam consumption than the small engines of a locomotive with their constant starting and stopping, and consequent cooling of cylinders, etc. Another item in which a considerable saving is made is in the cost of repairs and renewals to the motor equipment as compared with locomotives.

The second advantage — increase in capacity for handling passengers — is due, first, to the fact that with electric motors a much higher rate of acceleration can be obtained in starting trains, thereby increasing the average speed over a given line of road. The trains can also be handled with so much greater accuracy and precision that a much shorter interval is perfectly safe, all of these directly contributing to the end of greater capacity.

The third item — service more attractive to the public generally — is proved by the facts of the absence of smoke and steam, and the great reduction in noise, these being especially important in systems passing through the heart of a large city, as is the case with elevated roads. In regard to the use of the third-rail system on interurban roads, the same general considerations apply as to the economy of operation, except that, trains being less frequent, the economy in the power generation is not so great an item. There is another field for the third-rail electric railway system, which has been developed by the New York, New Haven & Hartford steam road, and that is the use of light trains for suburban and interurban service on many of their branch lines.

One of the most difficult problems in equipping an electric railway system is the proportioning of the total capacity of a power house to the number of cars run, and the subdivision of this total capacity into proper-sized units. In order to determine these points, it is necessary to be able to estimate the maximum loads that will have to be carried during the rush hours, and the minimum loads during midday and midnight. The maximum load does not always depend upon the total number of trains run, as on some lines more than half of these trains will be running light in one direction in order to carry the crowds back on their return or *vice versa*. In subdividing the total capacity of a power house, it is desirable to have a single unit which will carry the minimum light load with reasonable economy. The load on a power house operating in connection with an elevated railway system, varies not only from a maximum during rush hours to a minimum during off hours, but also momentarily during the starting and stopping of trains, these fluctuations being most violent when the least number of trains are in service. Under the worst conditions, this rate will vary from 300 amperes to 4,000 in 15 seconds, or the reverse. It is necessary, therefore, that all parts of the engine

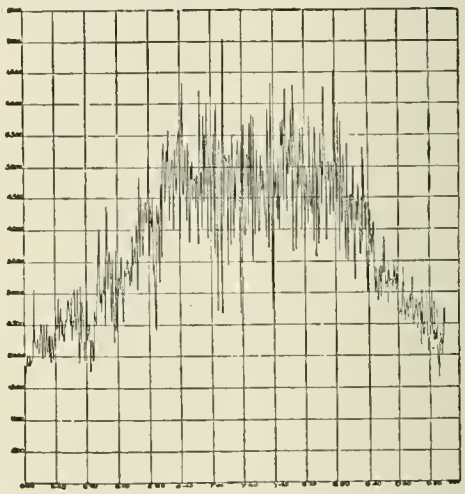


FIG. 2.— Diagram showing fluctuations in the consumption of electrical energy on the Metropolitan Elevated Railway, Chicago, at short intervals from 5 a. m. to 9:30 a. m., ranging from 1,700 to 7,000 amperes.

should be especially heavy, particularly the fly wheel, in order that sudden changes in the load should not interfere with the proper regulation of the engine speed.

The accompanying diagram, Fig. 1, shows a typical load curve at the power house. Curve A is that of the trains in service. Curve B shows the additional amount of energy for heating the cars, with heaters only partly turned on during the rush hours; while curve C gives the total load with heaters turned on full during the rush hours. The high peaks of the curve occur at the rush hours of travel.

The second diagram, Fig. 2, shows the violent fluctuations in the demand for electrical energy for operating the trains.

In the third-rail system the use of the ordinary track rail for the conductor was largely a matter of convenience in the first case, as rails were the easiest form of steel to obtain in reasonable lengths, and their shape was such as to lend themselves to the various requirements of attaching bonds, angle bars, and insulating supports. The value of an ordinary commercial steel rail as an electric conductor, as compared with copper, is about 10 or 12 to 1, with of course the additional disadvantage against the rail of the necessity of the frequent bonding, the rails usually coming in 30-foot lengths. To offset this lower carrying capacity, however, com-

pare rails at $17 per ton with copper at $360 per ton, and it can be seen that one can afford to put in the larger amount of steel required for a given electrical capacity and still have a good margin in favor of the rails. A commercial 80-pound track rail has a carrying capacity about equal to an 800,000 c. m. copper cable. In purchasing the contact rails for the extension of a western railway line, they were made of steel of a special chemical composition, having a higher electrical carrying capacity than the ordinary commercial steel rail. The composition was obtained after a series of experiments conducted for the Manhattan railway in New York, with a view to getting the best possible conductor with a composition of steel that could be successfully rolled into rails. The use of this composition results in a steel rail so soft as to be unfit for ordinary railway service, but the conductivity is raised so that, compared with copper, the ratio is about 8 to 1, as against 12 to 1 for ordinary commercial steel rails.

H. M. Brinckerhoff, M.W.S.E.,
Superintendent Chicago Metropolitan Elevated Railway.

Thirlmere, thêrl'mēr, England, a long and narrow lake in the mountains of Cumberland County, in the centre of the Lake District, northwest of Mount Helvellyn, between Derwentwater and Grasmere. It is three miles long by a quarter of a mile wide. The city of Manchester bought and converted it into a reservoir for its water supply, and the system, begun in 1886, was completed in 1894 at enormous expense.

Thirlwall, Connop, English prelate and historian: b. Stepney, Middlesex, 11 Feb. 1797; d. Bath 27 July 1875. He was educated at the Charter-house and at Trinity College, Cambridge, where he obtained a fellowship. He afterward studied for the law, and was called to the bar in 1825. Having exchanged the law for the church he was ordained in 1828, and some years after received the living of Kirby Underdale, in Yorkshire. Here he added to his pastoral duties a variety of literary labors. The first of his works published by himself (his father had previously issued a number of essays and poems written by him in extreme youth) was a translation of Schleiermacher's 'Gospel of St. Luke,' to which he prefixed an introduction. This work appeared anonymously in 1825. His next work was a translation of the first two volumes of Niebuhr's 'History of Rome,' with Archdeacon Hare (1828–31). Then followed the work to which he chiefly owes his reputation — his 'History of Greece,' the first edition of which appeared in Lardner's 'Cabinet Cyclopædia,' in eight volumes, between 1835 and 1844. It was well received, and before the appearance of Grote's history (the first two volumes of which were published in 1846) was without a rival in the English language. Grote himself praises it for the learning, sagacity, and candor it displays, and said that if it had appeared a few years earlier he should probably never have conceived the design of his own work. In 1840 Thirlwall was presented by Lord Melbourne to the Welsh bishopric of Saint David's, which he resigned a little more than a year before his death. He was for a time one of the editors of the Cambridge 'Philological Museum,' and during the closing years of his life was a member of the committee for the revision of the Old Testament. He was one of the bishops who spoke and voted for Gladstone's bill for the disestablishment of the Irish Church. Consult: Perowne, 'Remains, Literary and Theological, of Connop Thirlwall' (1877); Thirlwall, 'Essays, Speeches, and Sermons' (1880); Stanley, 'Thirlwall's Letters to a Friend' (1881); Morgan, 'Four Biographical Sketches' (1892); Clark, 'Old Friends at Cambridge and Elsewhere' (1900).

Thirst, a craving for water or other drink. As appetite shows a need for the introduction of food into the system, so thirst is a sensation indicating the necessity of an increased supply of water. This sensation is referred to the throat, yet it is not a purely local feeling, but an index of the wants of the tissues at large, for thirst cannot be allayed unless the water swallowed, reaches the stomach, is absorbed and carried into the blood. Thirst may also be relieved by the direct introduction of water into blood-vessels, or by rectal injections of it, or by its absorption through the skin. How long the demands of thirst may be successfully withstood cannot be stated definitely, since human beings as well as the lower animals differ among themselves, and under varying circumstances of climate, etc., as to the degree of tolerance. Certain it is that of all substances a regular supply of water is most essential to the maintenance of life. If deprived of it for even eight or ten hours, greater inconvenience, pain, and debility are suffered by an individual than from an equal deprivation of solid food. As thirst is but the expression of a dearth of water in the tissues, any condition which causes a more rapid elimination of water than usual will increase thirst. Such is the effect of severe muscular exercise, especially, for example, the exertion in a heated atmosphere habitual with stokers, iron-puddlers, etc. Thirst is also increased by certain articles of food, excess of salt or sugar, for example: in febrile disorders; in severe diarrhœas and hemorrhages; in diabetes; in acute gastritis; in polyuria; in certain forms of hysteria, etc.

For allaying thirst nothing is so grateful as pure cool water, sipped a little at a time. Sweet drinks are apt to increase rather than relieve thirst; but the vegetable acids in oranges, lemons, grapes, limes, etc., have a tendency to allay thirst, and to lessen the desire for large quantities of fluid, which may cause discomfort. Toast-water, small pieces of ice, effervescent drinks, and dilute phosphoric acid, alone or combined with a little aromatic bitter, are also of value. In fever, cleansing the mouth, and swabbing it with glycerine, borax, and water is of more service sometimes than drinking large quantities of water.

Thirteenth Amendment. See United States, The Last Three Amendments to the Constitution of the.

Thirty-nine Articles, The, formally known as "Articles of Religion," 39 in number, which were framed and adopted as the recognized creed of the English Church after the accession of Queen Elizabeth. The articles were recorded as being "agreed to by the archbishops of both provinces and the whole clergy," first in a con-

vocation held in 1562, and afterward in another held in 1571. The Thirty-nine Articles gave prominence to the tenets which severed the Church of England from the Papacy. They denied the supremacy of the pope, and the asserted infallibility of the Roman Catholic Church and of general councils. They denounced the celibacy of the clergy, the denial of the cup to the laity, transubstantiation, five out of seven of the sacraments, the alleged worship of images, and works of supererogation. The articles set forth the doctrine and discipline of the Established Church, as they continue to this day, and are in effect the creed of the Church of England. The sovereign was recognized as the head of the church, and every person desiring to be a clergyman of the church was and is required to subscribe to the articles. Persons desiring to study at Oxford or Cambridge were required to subscribe to the Thirty-nine Articles until the requirement was abolished in the reign of Queen Victoria.

Thirty Tyrants, a body of Athenian aristocrats, headed by Critias and Theramenes, who undertook to administer the affairs of Athens at the close of the Peloponnesian war, 404 B.C. They put to death their opponents, and set a Spartan garrison in the Acropolis. Later Thrasybulus led the exiled citizens against Athens, defeated the forces of the Thirty, and slew Critias. Democratic government was restored and soon afterward recognized by Sparta.

The Thirty Tyrants of Rome were a band of revolutionists who tried to secure the imperial power during the reigns of Valerian and Gallienus, 253–268 A.D.

Thirty Years' War, so called because it lasted from 1618 to 1648, was at first a struggle between Protestants and Roman Catholics, north Germany supporting the former, and southern Germany, with Austria at its head, the latter cause. It gave the Swedes an opportunity to extend their dominion south of the Baltic, it reduced the resources and weakened the power of Austria, and it gained for the northern states of Germany the breathing space needed to develop independent existence. Few wars, however, have been more calamitous in their general effect on the mass of the people, and the happiness and progress of mankind. Apart from the horrors which attended the capture of Madgeburg, and other barbarous scenes of the struggle, it reduced the peasantry and most of the townspeople to abject misery; it may be said to have effaced for a time literature and art in Germany, and it magnified the system of petty principalities, since partly effaced as a result of the Napoleonic wars, but still a powerful obstacle in the way of complete German progress.

On the one side were Austria, nearly all the Roman Catholic princes of Germany, and Spain; on the other side were, at different times, the Protestant powers, and France. The occasion of this war is to be found in the fact that Germany had been distracted ever since the Reformation by the mutual jealousy of Roman Catholics, Lutherans, and Calvinists, which led the Protestant princes to form a Union in 1608, against which the Roman Catholic League was formed the following year. Certain concessions had been made to the Protestants of Bohemia by the Emperor Rudolph II. (1609), but these were withdrawn by his successor Matthias in 1614, and four years afterward the Bohemian Protestants were in rebellion. Thus began the first part of the long war, the part that is known as the Bohemian war. The Protestant Bohemians were led by the Count of Thurn, and the Union sent an auxiliary corps into Bohemia, under the command of the brave Ernest, count of Mansfeld. Their leaders drove the imperial troops from Bohemia, invaded the archduchy of Austria, and advanced to the gates of Vienna, but unfavorable weather and want of resources compelled the invaders to retreat. Soon after, Ferdinand, with the title of Ferdinand II., was chosen emperor (28 Aug. 1619). He had borne the title of king of Bohemia since the resignation of his cousin Matthias in 1617. The Bohemians, knowing his hostility to Protestantism, had already declared his title to the Bohemian crown void, and offered it to the elector palatine, Frederick V., the head of the Protestant Union, and husband of Elizabeth, daughter of James I. of England. Frederick accepted the crown, but he was ill fitted to cope with the difficulties before him, and the great victory of the troops of the League (8 Nov. 1620), under Maximilian of Bavaria, on the Weissenberg (White Mountain), near Prague, which was followed by the flight of the new king, put an end to the Bohemian rebellion, and crushed the Protestant cause in that quarter. Frederick was put under the ban of the empire, his territory was taken from him and bestowed on Maximilian of Bavaria.

Ferdinand had now a favorable opportunity of concluding a peace on moderate terms. But his unsparing treatment of the conquered, and the reactionary proceedings against the Protestants generally, all of whom had been expelled from Bohemia, at last roused the determined opposition of the Protestant princes, who sought and obtained foreign assistance. Aided by supplies of money from England, and by a body of troops from Holland, Count Mansfeld, Christian of Brunswick, and the Margrave of Baden again took the field, and they were joined by Christian IV. of Denmark. Mansfeld was defeated by the imperial general Wallenstein at Dessau (1626), and after a difficult march through Hungary to the lower Danube, died in Bosnia on the 30th of November in the same year. Meanwhile Christian of Brunswick had also died, and Christian of Denmark had been defeated by Tilly at Lutter am Barenberg, and compelled to withdraw to his own territory (1626). The allies of Denmark, the dukes of Mecklenburg, were now obliged to flee from their territories, which were taken possession of by Wallenstein with the consent of the emperor. Holstein, Schleswig, and Jutland also soon fell into the hands of the imperial troops. Pomerania and Brandenburg had detachments forced upon them by Wallenstein. The power of the emperor extended to the Baltic, and to secure this power an attempt was made to seize all the important towns on the coast. Stralsund alone made serious resistance, and during a ten-weeks' siege, which was carried on with furious energy (May to July 1628), it baffled all the attacks of Wallenstein, who was at last forced to retreat with great loss. This check thwarted the plans of Wallenstein, and led to a short

interruption of the war. In the peace of Lübeck (May 1629) Christian of Denmark received back all the territories belonging to him that had been occupied and devastated by the imperial troops, on the condition of promising to interfere no more in the affairs of Germany.

Austria was once more victorious; but the greater its victory the more complete was to be the triumph of the Roman Catholic Church. With this object the emperor issued the Edict of Restitution, in virtue of which all the ecclesiastical foundations and other church property that had been confiscated for the behoof of Protestants since the religious peace of Passau (1552) were to be restored to the Roman Church, and the Calvinists were to be excluded from the benefits of that peace. This ordinance, which threatened to take a large number of bishoprics, and almost all the abbeys and other ecclesiastical foundations of north Germany, out of the hands of those who then held them, filled all Protestant Germany with alarm and prolonged the war. Many princes and towns refused to obey it, and the emperor was obliged, in order to give effect to it, to keep his forces in the field. But these forces did not long remain under the command of Wallenstein. At a meeting of the Electoral College of the empire in August 1630, Ferdinand found it expedient to yield to the general demand for his deposition, and the supreme command of the imperial armies was given to Tilly, who thereupon marched against Magdeburg, which had refused to carry out the edict.

In the meantime a new belligerent appeared on the scene, one whose exploits form the most interesting episode of the whole war. This was Gustavus Adolphus, king of Sweden, who landed on the coast of Pomerania on the 24th of June 1630. The inducements which led him to mix himself up with the struggle were the desire of protecting Protestantism in Germany, that of establishing the power of Sweden on the coast of the Baltic, and that of checking the advance of the power of Austria in north Germany. For this last reason he had the secret support of the French minister Richelieu, who was jealous of the growing power of the house of Hapsburg. Gustavus Adolphus was generally hailed by the inhabitants of the Protestant states of Germany as their deliverer, but the Protestant princes did not extend to him so eager a welcome. Fearing the revenge of the emperor they for the most part refused his offered alliance, and at the diet of Leipsic resolved to maintain a neutral attitude. The old Duke of Pomerania, whose territory had been terribly devastated by the imperial troops, had at once opened his land to him, but the Electors of Brandenburg and Saxony refused him a passage through their territories, and while the time was consumed in negotiations the town of Madgeburg, after repeated assaults, was taken and destroyed (10 May 1631). Tilly now threatened Saxony, and the elector, John George I., hastened to conclude, in his own defense, the alliance which he refused in the interests of the Protestant cause. On 7 September the forces of Tilly and Gustavus Adolphus met at Breitenfeld, close to Leipsic, when the former were completely defeated. Tilly retreated to the south, while the Swedish king advanced to the Main and Rhine. Before the end of winter the latter had made himself master of the bishopric of Würzburg and the greater part of the Lower Palatinate, as well as of the towns on the Rhine. In the spring of 1632 he marched by way of Nuremberg to the Lech, on the banks of which Tilly had taken up a strong position. On 15 April this position was forced by the Swedes, and Tilly was mortally wounded during the engagement. After placing a garrison in Augsburg, Gustavus Adolphus, accompanied by the former Elector Palatine, Frederick V., advanced as far as Munich, the Bavarian capital. Meantime the emperor had in his distress again turned to Wallenstein, and induced him by entreaties and great concessions to undertake to levy and command a new army. After a successful operation against the Saxons, Wallenstein joined the Bavarian troops in Bohemia and marched with them into Franconia, where the Swedes had posted themselves strongly not far from Nuremberg. On arriving there Wallenstein took up another strong position in the neighborhood, and fortified a camp. Here the two armies lay for months facing one another without coming to a pitched battle; till at last Gustavus found that the resources of the neighborhood were exhausted, and resolved to venture upon an attack on the enemy's camp. But in spite of the bravery of the assailants, the attack, again and again renewed, was always repulsed. Gustavus Adolphus was obliged to give up the hope of success in his attempt, and soon after he led his troops into Saxony. Thither Wallenstein followed him, and on 6 Nov. 1632, a battle was fought at Lützen, near Leipsic, in which Wallenstein was defeated, but in which the victorious Swedes lost their king and leader.

After the death of Gustavus Adolphus the direction of the war was assumed by the Swedish chancellor Axel Oxenstierna, who, in the first place, got the Protestant princes and towns of the Franconian, Swabian, and the two Rhenish circles of the Germanic empire to promise in the Heilbronn Convention to uphold the Swedes until the victory of the Protestant cause should be secured. The principal generals who acted under him were Bernhard von Weimar, and the Swedish general Horn. France furnished supplies of money. Bavaria was laid waste by the Swedes, who, since the death of their king, carried on the war in as barbarous a manner as the imperial troops, who were now quartered in Silesia. In this province and in Bohemia Wallenstein lingered without exhibiting any of the energy that was demanded of him by the imperial court. This slackness, together with other circumstances, caused him to be suspected of entering into treasonable negotiations with the enemy, and Ferdinand ultimately deposed him and placed him under the ban of the empire, in consequence of which he was murdered by some of his own officers (25 Feb. 1634). After this the imperial army moved into Bavaria, and on 6 Sept. 1634, gained a complete victory over Bernhard von Weimar at Nördlingen. Several German princes, the principal of whom was the Elector of Saxony, who had never been well inclined to the Swedes, now thought it convenient to conclude separate peaces with the emperor, and the people generally began to cherish the hope of soon seeing the termination of the war. The separate peace with Saxony, the peace of Prague, was concluded in May 1635, and in it Saxony received

the whole of Lusatia as a hereditary possession, while the emperor virtually gave up the edict of restitution.

The hopes raised among the people of Germany by this and other separate peaces were far from being confirmed. Germany itself was almost unanimous in desiring peace, but the Swedes thought it their interest to continue the war in order not to lose the advantages they had gained, and France now determined to take a more active part in the war, with the view of abasing the house of Hapsburg and extending the French frontier to the Rhine. Richelieu promised to the Swedes important aid in money and troops, and the war was renewed with greater vigor than had been shown since the death of Gustavus Adolphus. The Swedish general Baner conquered and rendered desolate Saxony and Thuringia (1636); Bernhard von Weimar took Rheinfelden, Freiburg, and Breisach, and formed the scheme of creating for himself an independent principality on both banks of the Rhine, but was stopped short in his career by death in July 1639. In the midst of these events the emperor had died (February 1637), and had been followed by his son Ferdinand III., a man of milder and less energetic temper than his father, but as firmly attached to the Catholic faith, and equally inclined to force it on his subjects.

In the autumn of 1640 the new emperor assembled a diet at Ratisbon to deliberate over the best method of conducting the war, and while this council was sitting, Baner, who had for the last few years been constantly engaged in the east of Germany, conceived the audacious plan of leaving his winter quarters and taking the whole council, along with the emperor, prisoners (January 1641). A sudden thaw prevented the execution of this scheme by melting the ice on which he had hoped to cross the rivers. Baner died during the retreat. He was succeeded in the command of the Swedish army by Torstenson, the ablest of the generals who proceeded from the school of Gustavus Adolphus. Although generally confined by the gout to a sedan chair, he astonished the world by the rapidity of his movements. He vanquished the imperial armies near Leipsic (Breitenfeld 1642), advanced into Moravia with the intention of penetrating into Austria and attacking the emperor in his capital, then suddenly appeared in Schleswig and Holstein and put to flight Christian IV. of Denmark, who had lately allied himself with the emperor and brought an army into the field (1643). Later (August 1645), Wrangel, another Swedish general, forced Christian to accept a disadvantageous peace. After his victory over Christian IV., Torstenson again turned south, and having destroyed two imperial armies, one under Gallas and the other under Hatzfeld and Götz, in conjunction with Rakoczy, prince of Transylvania, once more threatened Vienna (1645). But the emperor was again delivered from the danger. The withdrawal of Rakoczy obliged Torstenson to give up his design; and in the following year, worn out by disease, he resigned his command, which was taken up by Wrangel. Meantime the French had been operating on the Rhine and in the west of Germany. After the death of Bernhard von Weimar they had taken his army into their pay. At the head of this army Guébriant obtained several successes, but toward the close of 1643 suffered a severe defeat in which his army was in great part destroyed. He himself was mortally wounded soon after. In the following year neither of the French generals Enghien and Turenne was able to gain any considerable advantage; but on 3 Aug. 1645, the Austrian general Mercy was defeated at Allersheim, near Nördlingen, after which the junction of the French and Swedes was inevitable. Late in the summer of 1646 their united armies advanced through Swabia and Bavaria, and in the armistice of Ulm (March 1647) compelled Maximilian of Bavaria to fall away from the emperor. In the following year further successes were gained, and Wrangel was on the point of uniting his forces with those of the other Swedish general Königsmark who had penetrated into Bohemia, when the news reached the armies that the Peace of Westphalia, which had been negotiating for five years at Münster and Osnabrück, was concluded. By a singular coincidence it happened that the last blow of the war was struck at the place where the war originated, Prague. Königsmark had taken one part of the town, and was preparing to attack the other when he was stopped by the news of peace. See AUSTRIA-HUNGARY; DENMARK; FRANCE; GERMAN LANGUAGE AND LITERATURE; GERMANY; GERMAN CATHOLICS; GERMAN EVANGELICAL PROTESTANT CHURCH; GUSTAVUS II. ADOLPHUS; SPAIN; SWEDEN; WALLENSTEIN.

Consult: Prof. A. W. Ward, 'Thirty Years' War' (1869); S. R. Gardiner, 'Thirty Years' War' (1874); and German works by Schiller, Barthold, Gindely, and others.

Thisbe, thĭz'bē, according to classical legend, a Babylonian maiden beloved by the youth Pyramus. Their homes adjoined and since their parents prevented their marriage they managed to converse through a hole in the garden wall. Having arranged a meeting at Ninus' tomb, Thisbe, who was first at the spot, hearing a lion roar, ran away, dropping her mantle in her fright. The lion seized the garment and tore it, and when Pyramus arrived and saw the blood-stained garment, he concluded that a lion had slain and eaten Thisbe, and stabbed himself in despair. Thisbe, returning to the tomb, saw Pyramus dead, and killed herself also. The story is introduced as a farce in 'The Midsummer Night's Dream,' by Shakespeare.

Thistle, a composite plant of the genera *Carduus, Centaurea, Cnicus, Onopordon* or *Sonchus.* Other related plants are the golden thistle or Spanish oyster-plant (*Scolymus hispanicus*) whose roots are used as a vegetable like salsify and parsnip, which they resemble somewhat closely in flavor; globe-thistles (*Echinops*) often planted in shrubberies and herbaceous borders for their striking effects; blessed thistle (*Carbenia benedicta*) a hardy annual herb useful for rockeries and wild gardens, but commonly regarded as a weed in the Mediterranean region where it is native, and in California where it has escaped cultivation; and the milk-thistle, also called blessed or holy thistle (see SILYBUM), often grown in European gardens for its edible roots, leaves and heads and also for its ornamental qualities. Several plants of other orders have sometimes been

called thistle from their apparent resemblance to true thistles. The best known of these are probably the blue thistle (*Echium vulgare*) of the *Boraginaceæ*, and the fuller's or clothier's teasel (*Dipsacus fullonum*) and its few related species of the order *Dipsacaceæ*.

Among the best known genera the following species are probably most widely recognized. The Scotch or cotton thistle (*Onopordon acanthium*) is a biennial occasionally grown in America and sometimes seen wild in the Eastern States. It has cottony white spiny foliage and large solitary terminal heads of pale purple flowers. The plants are often six feet tall, and are planted in front of dark colored shrubbery. They seem unlikely to prove troublesome as weeds in America. Some of its other popular names are Queen Mary's, silver, Argentine, oat, asses', and down thistle. The Scottish emblem seems more likely to be really the stemless thistle (*Cnicus acaulis*) which is common in Scotland. The so-called Canada thistle (*Carduus arvensis*) is a native of Europe. It has become a troublesome weed in fields where methods of cultivation and rotation are faulty, spreading both by its seeds and its perennial creeping rootstocks, every fragment of which is capable of propagating a new plant. Prevention of leaf formation by persistent cultivation is a sure remedy as well as a safeguard. The plant is a slender herb about three feet tall and has numerous small purplish pink flower heads. The bull thistle (*C. lanceolatus*) and the yellow thistle (*C. horridulus*) are also well known relatives found along roadsides and in fields, especially pastures. The pasture thistle (*Cnicus pumilus*) is found in similar places. The genus *Carduus* is distinguished from *Cnicus* by having bristly pappus instead of plumose, by reason of which the latter species are often called plume thistles. The star thistle (*Centaurea calcitrapa*, etc.) bears a resemblance to the blessed thistle (*Carbenia*) which was formerly united with it by botanists. Several related species, notably the corn flower, blue bottle, bachelor's button, or bluet (*C. cyanus*) and the dusty miller (*C. cineraria*) are popular garden plants. Three species of sow thistles — the common (*Sonchus oleraceus*), the field (*S. arvensis*), and the spiny leaved (*S. asper*) — are well-known weeds in the United States and the Carline thistle (*Carlina vulgaris*) plays a similar role upon poor soils in Europe. The last was so named because tradition says that Charlemagne used its roots medicinally.

Thistle-bird, the American goldfinch (q.v.).

Thistle Crown, the name of a gold coin of James VI. of Scotland, of the value of 97.3 cents. It bore on the obverse a rose, and on the reverse a thistle, both crowned.

Thistle, Order of the. See ORDERS, ROYAL.

This'tlewood, Arthur, English conspirator: b. Tupholm, Lincolnshire, 1770; d. London 1 May 1820. He is said to have imbibed anarchistic doctrines from the writings of Paine and from a visit to France before the fall of Robespierre. He entered the army in 1798 and rose to the rank of a lieutenant. After various misfortunes, both natural and the result of gambling and dissipation, he became an active member of the society formed by Thomas Spence, which aimed at revolutionizing all social institutions. He attempted to organize a revolution in 1816 which failed through the efforts of informers, and in 1817 was indicted for treason, but escaped conviction. In 1818–19 he suffered a year's imprisonment for a threatened breach of the peace. After his release he became the principal agent in the memorable Cato Street conspiracy (so called from the meeting-place of the conspirators in London), the object of which was to murder several of the members of the administration at a cabinet dinner, attack either Coutts's or Child's bank, seize the Tower and Mansion House and set up a provisional government. The day selected for carrying out the plot was that fixed for the funeral of George III. at Windsor, when all the military would be out of London to take part in the funeral procession. This absurd scheme was betrayed by a man who was ostensibly one of the conspirators and the deepest in Thistlewood's confidence. The projectors were arrested just as they were about to proceed to the execution of their purpose 23 Feb. 1820. Being tried and condemned as a traitor, Thistlewood, with four of his coadjutors, was hanged and decapitated.

Thistlewood Conspiracy. See CATO STREET CONSPIRACY.

Thivæ, thē'vē. See THEBES.

Tho'burn, James Mills, American Methodist Episcopal bishop: b. Saint Clairsville, Ohio, 7 March 1836. He was graduated at Allegheny College, Meadville, Pa., in 1857, and soon after entered the ministry. In 1859 he was sent as a missionary to India, and has ever since been identified with work in that region. He was elected bishop of India and Malaysia in 1888, and was for six years the editor of the 'Indian Witness.' His writings include: 'Missionary Addresses' (1887); 'India and Malaysia' (1893); 'The Deaconess and Her Vocation' (1893); 'Christless Nations' (1895); 'The Church of Pentecost' (1901); and 'Life of Isabella Thoburn' (1903).

Tholen, tō'lĕn, Netherlands, an island in the province of Zeeland, north of the Ooster Schelde, contains 51 square miles. It is protected by dikes. The soil is productive and the principal products are wheat, rye, barley, oats, flax, madder, beans and potatoes. Tholen is also the name of the chief town, with 2,758 inhabitants.

Thom, tŏm, **James**, Scottish sculptor: b. Ayrshire, Scotland, 1799; d. New York 17 April 1850. He was by trade a stonemason, and suddenly leaped into notice by his group 'Tam o' Shanter and Souter Johnny,' cut in the sandstone on which he was accustomed to work. This group now forms part of the Burns monument at Doon, near Ayr. It was first exhibited in Edinburgh (1828) and by its success the sculptor was led to move to London, but in 1837 sailed for the United States, where his genius found at last a liberal recognition. Among his best known works is 'Old Mortality' now in Laurel Hill Cemetery, Philadelphia, of which he was induced to make many replicas.

Thomas, Saint, also called **Didymus** (the former being the Aramaic, the latter the Greek word signifying "twin"), one of the Twelve Apostles. He is said to have been a native of

Antioch. Eusebius says that his real name was Judas. The scene in the Gospel, in which the doubts that Thomas had expressed with great vehemence as to the fact of the resurrection were at last dissipated, is the chief of the three occasions on which he is prominent. He is said to have preached the gospel among the Parthians; but the particulars of his life are unknown. Tradition relates with great circumstantiality that he baptized a king, Gundaphoras or Gundaphares, whose name is known to archæologists through many inscriptions and coins as reigning in Peshawar, on the Indus. His grave was believed by the early Church to be at Edessa, and Chrysostom mentions it as one of the four genuine tombs of the apostles, the other three being those of Peter, Paul, and John. Late traditions bear that Thomas went farther east than Persia, and was the founder of the church in Malabar, known as the Christians of St. Thomas; but this is doubtful. (See CHRISTIANS OF ST. THOMAS.) An apocryphal 'Gospel of Thomas' is published in Tischendorf's 'Evangelia Apocrypha.' See APOCRYPHA.

Thomas, tō-mä', **Ambroise Charles Louis**, French musical composer: b. Metz 5 Aug. 1811; d. Paris 12 Feb. 1896. He studied in the Paris Conservatoire, and in 1832 gained the Grand Prix, which enabled him to continue his studies in Italy. Returning to France he began to write for the Opéra Comique, his first opera being 'La double Echelle' (1837). Among his early operas may be cited also 'Betty' (1846); 'Le Caïd' (1849), and opera bouffe; and 'Le Roman d'Elvire' (1860). He is best remembered, however, by the more serious works of his later years, 'Mignon' (1866); 'Hamlet' (1868); and 'Françoise de Rimini' (1882). He was appointed professor of composition at the Paris Conservatoire in 1852, and in 1871 succeeded Auber as director. His non-operatic works include a 'Messe Solennelle' (1857), a 'Marche Religieuse' (1865), cantatas, and chamber music.

Thomas, tŏm'ȧs, **Annie.** See CUDLIP, ANNIE THOMAS.

Thomas Aquinas. See AQUINAS, THOMAS.

Thomas, Arthur Goring, English composer: b. Ralton Park, Sussex, 20 Nov. 1850; d. 20 March 1892. He studied at Haileybury College and his musical education was received at Paris, and at the Royal Academy of Music. His opera, 'The Light of the Harem,' was given with acceptance while he was still a student at the academy. In 1883 his second opera 'Esmeralda' was produced at Drury Lane Theatre and was warmly received. In 1885 followed 'Nadeshda' and 'The Golden Web,' the latter being completed by S. P. Waddington and produced at Liverpool in 1893. Besides his operas he composed 'The Sun Worshippers,' a choral ode, 'Out of the Deep,' and 'The Swan and the Skylark,' both cantatas, the latter one being finished by Sir C. V. Stanford. He is commemorated by the Goring Thomas scholarship at the Royal Academy of Music.

Thomas, Arthur Lloyd, American banker: b. Chicago 22 Aug. 1851. In 1880 he was supervisor of the census of Utah, and in 1884 was a member of the commission to complete and codify the laws of Utah. He was governor of Utah 1889–93, and during his term of office the practice of plural marriages was formally renounced by the Mormon Church. In 1898 he was appointed postmaster of Salt Lake City and reappointed in 1902.

Thomas, Augustus, American playwright: b. Saint Louis, Mo., 8 Jan. 1859. He was a special writer and illustrator on Saint Louis, Kansas City and New York newspapers, and was editor of the 'Kansas City Mirror.' He is the author of the popular dramas, 'Arizona'; 'In Mizzoura'; 'The Burglar'; 'The Man Upstairs'; 'On the Quiet'; 'The Earl of Pawtucket'; etc.

Thomas à Becket. See BECKET, THOMAS À.

Thomas, Cyrus, American archæologist and entomologist: b. Kingsport, Tenn., 27 July 1825. He practised law for several years prior to entering the Lutheran ministry in 1864. He was naturalist on the United States Geological Survey 1869–74 and professor of natural sciences in the Southern Illinois Normal University 1874–7. He was State entomologist of Illinois 1875–82, and since 1882 has been ethnologist in the United States bureau of ethnology in charge of mound explorations. Of special interest in this later line are his 'Study of the Manuscript Troano' (1882); 'Notes on Certain Maya and Mexican Manuscripts' (1884); 'Mound Exploration' (1888); 'Pre-historic Works East of the Rocky Mountains.'

Thomas, Edith Matilda, American poet: b. Chatham, Ohio, 12 Aug. 1854; d. N. Y. City, 1901. She was educated at the State Normal School, Geneva, Ohio. Much of her verse was distinctly above the average, displaying not only very subtle feeling, but great delicacy of expression. She contributed to many periodicals, and published in book form: 'A New Year's Masque, etc.' (1885); 'The Round Year' (1886); 'Lyrics and Sonnets' (1887); 'Children of the Seasons,' series (1888); 'Babes of the Year' (1888); 'Babes of the Nations' (1889); 'Heaven and Earth' (1889); 'The Inverted Torch' (1890); 'Fair Shadow Land' (1893); 'In Sunshine Land' (1895); 'In the Young World' (1895); 'A Winter Swallow and Other Verse' (1896); etc.

Thomas, George Henry, American soldier: b. Southampton County, Virginia, 31 July 1816; d. San Francisco, Cal., 28 March 1870. On his father's side he was of Welsh and English ancestry. His mother was of Huguenot descent. He received his early education at Southampton Academy, near his home, and soon after his graduation was appointed to a cadetship at the West Point Military Academy, by the Hon. John Y. Mason, member of Congress from the Southampton District. He was graduated at West Point in 1840, standing 12th in a class of 42 members, W. T. Sherman being 6th. He was a thoughtful and industrious student at the academy, a characteristic that followed him throughout his later military career. In 184c he was appointed lieutenant in the 3d Artillery. He served in the war against the Seminoles in Florida, and later in the Mexican War, and was brevetted captain and major for meritorious services at Monterey and Buena Vista. He was instructor at the Military Academy in 1851–4 In 1852 he was united in marriage with Miss Frances Kellogg, of Troy, N. Y. He was commissioned major of the 2d Cavalry in 1855,

and for some years was upon duty on the western frontier, and engaged in campaigning against hostile Indians.

Upon the breaking out of the Civil War he espoused the cause of the Union, and was appointed brigadier-general of U. S. Volunteers. It has been stated that early in 1861, during the period of suspense and uncertainty that preceded the war, he was vacillating in his loyalty to the government, and that he applied for services in the Southern army; but this is not true, as is clearly shown by the facts presented by his biographers, Van Horne, Piatt and Coppee. In June 1861, he was assigned to the command of General Patterson, with the U. S. forces in the Valley of Virginia, but was soon transferred to the west, and was placed in command of the 1st division of the Union army in Kentucky. On 19–20 Jan. 1862, he won the first important victory gained by the government forces in the West, signally defeating the Confederates under General Zollicoffer, at the battle of Mill Springs (q.v.), in Kentucky, and was promoted to the rank of major-general of volunteers and thanked by President Lincoln in a complimentary order. At the battle of Stone River (q.v.), near Murfreesboro, his command held the centre of the Union line, where he gave additional evidences of his abilities as a commander, and of his staying qualities as a fighter. At the battle of Chickamauga (q.v.), in September 1863, Thomas commanded the Fourteenth corps composed of three divisions of Rosecrans' army, and at the crisis of the engagement on 20 September he held the left of the general line, and successfully resisted the repeated attacks of the Confederates. About noon the right wing of the army, weakened by the withdrawal of troops to protect Thomas' left flank, gave way before the assaults of Hood and Longstreet. The right of the army was routed, but Thomas reformed his troops on Snodgrass Hill, and with the aid of reinforcements brought forward by General Gordon Granger, and other detachments, checked the onslaught of the victorious Confederates, repelled their repeated attacks, and held the position until nightfall, when he safely withdrew his forces to Rossville. His defense of Snodgrass Hill was one of the most dramatic events and one of the most deadly struggles of the Civil War. He fairly won the title of the "Rock of Chickamauga," by which he is so well known.

In the engagement of November, 1863, in front of Chattanooga (q.v.), General Thomas' forces stormed the heights of Missionary Ridge, and drove General Bragg's army from its strong position on the crest, gaining a complete victory over the Confederates. In the campaign against Atlanta (q.v.) in 1864 Thomas was second in command to General W. T. Sherman, and ably co-operated with that great soldier in accomplishing the brilliant series of successes achieved by the Union army. When General Sherman left Atlanta and marched with his army through Georgia to the sea, General Thomas took command of the Federal forces remaining in Georgia, Alabama and Tennessee, and prepared to meet the Confederate forces under General Hood, then threatening an advance into Tennessee. General Thomas then began the concentration of his forces at Nashville (q.v.). His troops under Schofield and Stanley stayed Hood's advance at Franklin, Tenn., and inflicted terrible losses upon the Confederates, but Hood soon appeared before Nashville and threatened to attack the city. General Thomas was now reinforced by General A. J. Smith's command from Missouri, and a large force of cavalry under General J. H. Wilson. Time was needed for equipping the cavalry and reorganizing the troops. Severe winter weather had set in, and the hills about Nashville were covered with ice and sleet,—thus delaying military operations. Meantime the authorities at Washington became impatient at the delay, and ordered Thomas to attack Hood. General Thomas explained and remonstrated, and took due time for preparation. Orders were issued finally relieving Thomas from his command, but before they could be executed he attacked Hood's army and gained one of the most complete and brilliant victories of the war, routing and almost dispersing Hood's forces. General Thomas, by these results, fully vindicated his judgment against all criticism, and received the thanks of the President and Congress for his splendid victory. He was also commissioned a major-general in the regular army.

At the close of the war he was in command of the Department of the Cumberland at Nashville, and was most useful in reorganizing and sustaining the civil laws and government in Tennessee and the adjacent States. His high personal character, executive ability and good judgment were instrumental in establishing peace and good order throughout that section. General Thomas must be credited with a very high order of military ability, and a most honorable place in the history of the Civil War. He made no serious military mistakes, and can be charged with no defeats.

After the closing of the war he was assigned to the command of the Military Division of the Pacific, with headquarters at San Francisco, where he died. His wife survived him but a few years. They had no children.

GATES P. THRUSTON, LL.D.

Thomas, George Housman, English illustrator and engraver: b. 7 Dec. 1824; d. Boulogne, France, 21 July 1868. He began life as an apprentice to a wood engraver, and practised that art in Paris, but gave the greater part of his time to book illustration, in which he became very proficient. He lived in the United States in 1846–7, and made designs for banknotes. After his return to England he became draftsman on the 'Illustrated London News.' His notable pictures are 'The Queen Giving Medals to Crimean Heroes,' and 'The Queen and Prince Albert at Aldershott.'

Thomas, Hiram Washington, American Methodist clergyman: b. Hampshire County, Va., 29 April 1832. He entered the ministry of the Evangelical Association in 1852 and of the Methodist Episcopal Church in 1856. In 1880 he was pastor of the People's Church, Chicago, but in 1881 was tried for heresy and expelled from the Methodist ministry. He has published: 'Origin and Destiny of Man'; 'Life and Sermons'; 'The People's Pulpit'; etc.

Thomas, Isaiah, American printer and bookseller: b. Boston 19 Jan. 1749; d. Worcester 4 April 1831. He was apprenticed to Zachariah Fowles, a Boston printer, with whom he established the 'Massachusetts Spy,' of which he soon became sole proprietor. So bold were his Whig

editorials that in 1771 he was summoned to appear for alleged sedition. He refused, and the attorney-general, when ordered to prosecute, failed to obtain a bill of indictment from the grand jury. After participation in the skirmish at Lexington, he continued the publication of the 'Spy' at Worcester, where it thereafter appeared with the exception of a brief period in 1776–7. It is the oldest journal in the State. In 1788 he opened a book-shop in Boston, with branches in various parts of the United States. Among his publications were the 'Massachusetts Magazine' (8 vols. 1789–95); a folio Bible (1791); and several editions of Watts' 'Psalms and Hymns.' He was the founder (1812), first president, and most liberal patron of the American Antiquarian Society. He published a 'History of Printing' (1810), which contains much valuable material. This was reprinted in 1874 by the Antiquarian Society. Consult Lincoln, 'History of Worcester' (1837).

Thomas, Jesse Burgess, American Baptist clergyman: b. Edwardsville, Ill., 29 July 1832. He was graduated from Kenyon College in 1850, and practised law in Chicago 1857–62. He was pastor of the First Baptist Church, Brooklyn, 1864–9, of the Michigan Avenue Baptist Church, Chicago, 1869–74, and from 1874–88 was pastor of the First Church, San Francisco. Since 1888 he has been professor of church history at the Newton Theological Seminary. He has published: 'The Old Bible and the New Science'; 'The Mould of Doctrine'; etc.

Thomas, John, American physician and soldier: b. Marshfield, Mass., 1725; d. Chambly, P. Q., 22 June 1776. He was sent as surgeon to the army in Nova Scotia in 1746; was on the medical staff of General Shirley's regiment in 1747; but secured an appointment as lieutenant in 1759. In 1760, while commanding a regiment under Amherst, he was engaged in operations against the French at Lake Champlain and at Montreal. He was a delegate to the Massachusetts provincial congress 1774–5 and having, during the Revolution, raised a regiment of volunteers, was appointed brigadier-general. He took part in the siege of Boston; forced the British to evacuate Dorchester; and participated in the Canadian campaign.

Thomas, John Rogers, American singer and composer: b. Newport, Monmouthshire, Wales, 26 March 1829; d. New York 5 April 1896. He made his first public appearance in 1847 at Newport, and came to the United States in 1849. He composed the music for many songs once well known ('Tis but a Little Faded Flower,' 'Beautiful Isle of the Sea,' and others), and wrote a 'Te Deum' in B flat.

Thomas, John Robert, American jurist: b. Mount Vernon, Ill., 11 Oct. 1846. He was educated at Hunter College, Ind., and served in the Union army during the Civil War. He was city attorney for Metropolis, Ill., for two terms, and State's attorney for four years. From 1879–89 he was a member of Congress. From 1897 to 1901 he was judge of the United States courts of Indian territory, and in the latter year resumed his legal practice. In 1905 he was chairman of the Constitutional Convention for the new State of Sequoyah.

Thomas, Joseph, American lexicographer: b. Cayuga County, N. Y., 23 Sept. 1811; d. Philadelphia 24 Dec. 1891. He was educated at Rensselaer Polytechnic Institute, Troy, N. Y., and at Yale, was graduated in medicine at Philadelphia, and engaged in practice there. He was in India in 1857–8, where he made a study of Oriental languages, and later spent four months in Egypt in the study of Arabic. He was subsequently professor of Latin and Greek at Haverford College, Pa. He was associate editor with Thomas Baldwin of 'A Pronouncing Gazetteer' (1845), which was revised and published as 'A Complete Pronouncing Gazetteer or Geographical Dictionary of the World' (1855); 'A New and Complete Gazetteer of the United States' (1854); etc. He also wrote: 'A First Book of Etymology' (1851–2); 'Travels in Egypt and Palestine' (1853); 'A Comprehensive Medical Dictionary' (1864); 'Universal Pronouncing Dictionary of Biography and Mythology' (1870–1); and other works. He contributed the pronouncing vocabulary of proper names to 'Webster's Unabridged Dictionary.'

Thomas à Kempis. See KEMPIS.

Thomas, Lorenzo, American soldier: b. Newcastle, Del., 26 Oct. 1804; d. Washington, D. C., 2 March 1875. He was graduated from the United States Military Academy in 1823. At the organization of the adjutant-general's department he received a major's commission and served as chief of staff of the army in Florida 1839–40, and in the same capacity on the staff of General Butler during the Mexican War. In 1861 he became brigadier-general and adjutant-general of the army, and was retired from active service in 1869.

Thomas, Reuen, American Congregational clergyman: b. Birmingham, England, 14 Jan. 1840. He was educated at University College, London, and entered the ministry in 1862. He has for many years held the pastorate of the Harvard Church, Brookline, Mass., and has published: 'Divine Sovereignty' (1885); 'Through Death to Life' (1888); 'Leaders of Thought in the Christian Church' (1892); 'The Kinship of Souls,' a novel (1899).

Thomas, Seth, American manufacturer: b. Plymouth Hollow (now Thomaston), Conn., 1 Dec. 1816; d. there 28 April 1888. He was the son of Seth Thomas (1786–1859), in whose honor Thomaston was named, and who began the manufacture of metal-movement clocks. The son greatly enlarged the business, introducing his clocks throughout the world. He manufactured all sorts of timepieces.

Thomas, Theodore, American musician: b. Esens, East Friesland, 11 Oct. 1835; d. Chicago, Ill., 4 Jan. 1905. He played the violin in public at the age of 6, and when only 10 made his first public appearance in New York. In his early concert and operatic engagements he appeared with Jenny Lind, Sontag, Grisi, and Mario. During 1855–69 he was associated with Mosenthal, Bergmann, Matzka, Bergner, and William Mason in successive seasons of chamber-music concerts. In 1864, having organized the orchestra which long went under his name, he began his symphony concerts in New York. These were continued, excepting the interval from 1869 to 1872, until 1878, when he went to Cincinnati to become director of the College of Music. With an orchestra, sometimes of 40, and later enlarged to 60 pieces, he visited the

large cities of the East and West, giving concerts of both popular and classical music, and did much for the development of musical taste. With his name were associated the biennial musical festivals held in Cincinnati from 1873 to 1898. Festivals of a similar character were held under his direction in Chicago in 1882 and 1884, and in New York in 1882. As early as 1862 he was appointed conductor of the Brooklyn Philharmonic Society; when the New York Philharmonic Society was organized he was chosen its leader; and both positions he retained until 1891 when he made his residence in Chicago and became leader of the permanent orchestra in that city. In 1893 he was appointed musical director of the World's Columbian Exposition.

Thomas, William Widgery, American diplomat: b. Portland, Maine, 26 Aug. 1839. He was graduated from Bowdoin College in 1860 and in 1862 entered upon a diplomatic career as bearer of United States government despatches. Prior to 1865 he at various times served as vice-consul-general at Constantinople, acting consul at Galatz, Moldavia, and as war-consul, Gothenburg, Sweden. In 1866 he resigned from government duties and was admitted to the Maine bar. He became commissioner of public lands in Maine in 1869, and from 1870–73 was commissioner of immigration; in 1873–4 he was a member of the State legislature and speaker of the House 1874–5.

He has published a translation of 'The Athenian' from the Swedish of Victor Rydberg, (1869); 'Sweden and the Swedes' (1891).

Thomas of Cela'no, religious poet: b. Celano in the Abruzzi; d. about 1255. He was among the earliest followers of Saint Francis d'Assisi, and in 1221 was warden of the Minorite houses of Worms, Mayence, and Cologne, and provincial of the order for Germany. He returned to Assisi in 1230. There is much reason for thinking that he was the author of 'Dies Iræ, Dies Illa' (q.v.). He also wrote the two sequences, 'Fregit Victor Virtualis'; and 'Sanctitatis Nova Signa.' Consult Lisco, 'Dies Iræ, Hymnus auf das Weltgericht' (1844).

Thomas of London. See BECKET, THOMAS À.

Thomas the Rhymer. See RHYMER, THOMAS.

Thomas, Gospel of, one of the New Testament apocryphal books, written in the early half of the 2d century. It treats of the boyhood of Jesus and represents him as performing miracles; it was used by the Gnostics, and probably in its original form was much more strongly Gnostic in doctrine than now, having been subjected to an orthodox revision. The book in its present form is fragmentary. There is a Latin translation, and a Syriac version with English translation was published in 1875.

Thomasius, tō-mā'zē-oos, **Christian,** German philosopher and jurist: b. Leipsic 1 Jan. 1655; d. Halle, Germany, 23 Sept. 1728. He was educated at Frankfort-on-the-Oder, and became professor of law at Leipsic in 1681. In 1687 he substituted the German language for Latin in his lectures, and in the following year established a scientific magazine published in German. The caustic wit with which he criticized educational methods and religious topics of the day, together with his advanced views, on theology in particular, aroused a storm of opposition, and he was forced to leave Leipsic. He went first to Berlin, and thence to Halle in 1690, where he became one of the founders of the university, in which from 1691 until his death he was professor of jurisprudence. He was among the first to break away from traditional pedantry and mediæval terminology, introduced improved methods of study into various departments of learning, and as a jurist took a firm stand against trial and torture for witchcraft. He wrote: 'History of Wisdom and Folly' (1693); 'Thoughts and Reminiscences' (1723–6); and other important works. Consult works concerning him by Luden (1805); Wagner (1872); Nicoladini (1887).

Thomasville, tŏm'as-vĭl, Ga., town, county-seat of Thomas County; on the Savannah, F. & W. and the Atlantic C. L. R.R.'s; about 10 miles from the Florida boundary and 55 miles south of Albany. It is in an agricultural and stock-raising region. The chief industrial establishments are cotton compresses, cigar factories, and creameries. There is a large trade in cotton, wool, fruit, vegetables, and grain. A branch of the State University, called the South Georgia Agricultural and Mechanical College, is located here. Other educational institutions are the Young Female College, the graded schools, and a public library. There are four banks: one national has a capital of $100,000, and the three state banks have a combined capital of $362,000. There is one branch savings bank and trust company. Pop. (1890) 5,514; (1900) 5,322.

Thomism, tō'mĭzm, one of the two great schools of scholasticism, the other being Scotism (q.v.). It derived its name from its founder, Saint Thomas Aquinas, the great Dominican doctor; while Thomism and Scotism are both scholastic in their fundamentals they differ in various conclusions and corollaries chiefly as follows: (1) on the nature of universals; (2) the principle of individuation; (3) the manner in which grace acts on the human will; (4) the proof of the immortality of the soul; (5) freedom from original sin in the case of the mother of Christ; (6) the effects of the merits of the Incarnation; (7) certain points on the mode of the efficacy of the Sacraments; (8) whether an action may be morally indifferent; (9) on the question of toleration. See AQUINAS, THOMAS.

Thompson, tŏmp'sŏn, **Albert,** American artist: b. Woburn, Mass., 18 March 1853. He studied art in his native country, and subsequently traveled in Europe 1872–5. Settling at Paris in 1880 he became the pupil of several French masters. Among his pictures may be mentioned: 'After the Shower'; 'Clearing Up'; 'More Wind than Rain'; and 'Changing Pastures.' Among his writings is 'Principles of Perspective' (1878).

Thompson, Alfred Wordsworth, American painter: b. Baltimore, Md., 27 May 1840. After three years study in Paris he made his first appearance at the Salon in 1865 and returned to New York three years later. He is a member of the National Academy, and of the Society of American Artists. As may be judged from the subjects of his pictures he has traveled widely in Europe, Asia Minor, and northern Africa. Among these paintings some of the best are: 'Desolation'; 'Twilight in Corsica'; 'The Market-Place in Biskra'; 'The Hour of

Prayer'; 'Tangier'; 'Review at Philadelphia, 1777'; and 'The Schoolhouse on the Hill.'

Thompson, Benjamin, Count Rumford, American physicist: b. North Woburn, Mass., 26 March 1753; d. Auteuil, near Paris, 21 Aug. 1814. He entered a Salem counting-house in 1766, was made major of New Hampshire militia, but, charged with being a Tory, fled to Boston, where he was associated with the British officers. He went to England in 1776, and as a reward for his services obtained a situation in the foreign office under Lord George Germain. He became under-secretary for the colonies in 1780, and was shortly afterward appointed lieutenant-colonel of the king's American dragoons. Returning to England in 1783, he retired on half-pay. In 1784 he was knighted and went to the Continent. Through the recommendation of the Prince of Zweibrücken (afterward king of Bavaria) he entered into the service of the reigning elector-palatine and Duke of Bavaria, when he effected many important and useful reforms in both the civil and military departments of the state, the latter of which he practically reorganized. As the reward of his success he received from the sovereign of Bavaria various orders of knighthood, was made a lieutenant-general, and created Count Rumford, the title being chosen by himself from the name of his wife's native town (now Concord, N. H.). He left Bavaria in 1795, and returned to England, where he employed himself in making experiments on the nature and application of heat, and on other subjects of economical and philosophical research. He clearly recognized that heat is a mode of motion, and that by a given amount of mechanical work a definite amount of heat may be produced. Among the objects which engaged his attention was the search for a remedy for smoky chimneys, which at that time formed one of the greatest nuisances in the country; and he succeeded in discovering the principles upon which fireplaces and chimneys have since been constructed. He likewise suggested the plan and assisted in the foundation of the Royal Institution, which led to other establishments of a similar description. In 1802 he removed to Paris, where he took up his residence; and, his wife being dead, he married the widow of the celebrated Lavoisier; but the union proved unfortunate, and a separation ere long took place. Count Rumford then retired to a country house at Auteuil, about four miles from Paris, and there devoted his time to the embellishment of his domain and to the cultivation of chemistry and experimental philosophy. His investigations respecting the strength of materials and the force of gunpowder led to considerable improvements in artillery; and he also made discoveries in connection with light and illumination. Count Rumford was by no means a man of extensive learning; but he was familiar with the discoveries and improvements of contemporary science, and the industry and perseverance with which he pursued his inquiries enabled him to make some considerable additions to the knowledge of chemistry and practical philosophy. He was the founder of the Rumford medal of the American Academy of Arts and Sciences, and of the Rumford professorship in Harvard University. His complete works were published by the Academy in 1872 with a full memoir.

Thompson, Sir Edward Maunde, English palæographist and bibliographer: b. Jamaica 4 May 1840. He was educated at Rugby and University College, Oxford, was appointed assistant in the British Museum in 1861, assistant-keeper of manuscripts in 1871, in 1878 keeper of manuscripts and Egerton librarian, and in 1888 principal librarian and secretary. In 1898 his official title as a servant of the British Museum was changed to director and principal librarian. He was knighted in 1895. For the Rolls Series he has edited 'Chronicon Angliæ, 1328–1388' (1874); 'Chronicon Galfridi le Baker de Swynebroke' (1889), and 'Adæ Murimuth Continuatio Chronicorum' together with 'Robertus de Avesbury de Gestis Mirabilibus Regis Edwardi Tertii' (1889); for the Camden Society, 'Letters of Humphrey Prideaux' (1875) and 'Correspondence of the Family of Hatton' (1878); for the Hakluyt Society, 'Diary of Richard Cocks in Japan' (1883); for the Royal Society of Literature, 'Chronicon Adæ de Usk' (1876); and for the Hellenic Society, with Sir R. C. Jebb, a facsimile of the Laurentian Sophocles (1885). In 1893 appeared his 'Handbook of Greek and Latin Palæography.'

Thompson, Elizabeth, English artist. See Butler, Lady Elizabeth.

Thompson, Elizabeth Rowell, American philanthropist: b. Lyndon, Vt., 21 Feb. 1821; d. Littleton, N. H., 20 July 1899. She was married to Thomas Thompson, a Boston millionaire, in 1845, and during his life engaged with him in philanthropic work. On his death in 1869 she inherited the entire income from his estate, and continued her charitable labors. She was an advocate of temperance reform, wrote a tract, 'Figures of Hell,' which was widely read, and contributed large sums for the furtherance of the cause. She gave $10,000 for an investigation of yellow fever in the South, and purchased and presented to Congress Carpenter's painting, 'Signing of the Emancipation Proclamation by President Lincoln in the Presence of his Cabinet.' She invested more than $100,000 in establishing heads of families in business, founded the town of Long Mont, Kan., and gave to each colonist 640 acres of land and $300. She contributed to the purchase of the Vassar College telescope, and was a generous benefactor of the American Association for the Advancement of Science, of which she was made the first patron. She was stricken with paralysis in 1888 and was afterward unable to continue her philanthropic work. In 1891 she was pronounced insane by a Kansas City jury, and a curator was appointed to the charge of her property in Missouri. She left an estate appraised at $400,000, with no public bequests.

Thompson, Francis, English poet: b. about 1860. He was the son of a Lancashire physician, was educated at Ushaw Roman Catholic College, near Durham, and studied medicine at Owens College, Manchester. He went to London, achieved reputation as a poet, and his fame has steadily increased. He is a contributor to the critical reviews, and has published: 'Poems' (1893); 'Sister Songs' (1895); and 'New Poems' (1897).

Thompson, Sir Henry, English surgeon: b. Framlingham, Suffolk, 6 Aug. 1820; d. London 18 April 1904. He was educated at Uni-

versity College, London, and was awarded the Jacksonian prize in 1852 for an essay on 'The Pathology and Treatment of Stricture of the Urethra,' and again in 1860 for an essay on 'The Healthy and Morbid Anatomy of the Prostate Gland.' In 1853 he became assistant surgeon to University College Hospital, surgeon 10 years later, professor of clinical surgery in 1866, and consulting surgeon in 1874. In 1884 he was professor of pathology and surgery to the Royal College of Surgeons. He received numerous honors from foreign countries, was knighted in 1867, and created a baronet in 1899. His works treat mostly of the urinary organs and their diseases, of cremation, and of diet. Among them may be mentioned: 'Clinical Lectures on Diseases of the Urinary Organs' (8th ed. 1888); 'The Preventive Treatment of Calculous Disease' (1888); 'Tumors of the Bladder' (1884); 'Cremation, or the Treatment of the Body after Death' (1874); 'Modern Cremation, its History and Practice' (4th ed. 1901), in which he advocates the substitution of cremation for the present method of sepulture; 'On Food and Feeding' (11th ed. 1901). He was also an artist of note, a pupil of Alma Tadema and others, and exhibited pictures at the Royal Academy, the Salon, and elsewhere.

Thompson, Henry Denman, American actor: b. Girard, Pa., 1833. His first appearance on the stage was as a dancer and Irish character actor. Later he wrote a comedy entitled 'Joshua Whitcomb,' which he has continued to present for many years in remodeled form under the title of 'The Old Homestead.'

Thompson, Jacob, American politician: b. Caswell County, N. C., 15 May 1810; d. Memphis, Tenn., 24 March 1885. He was graduated at the University of North Carolina in 1831, admitted to the bar in 1834, and engaged in law practice in Chickasaw County, Miss., in 1835. He was a member of Congress in 1839–51, and opposed the Compromise of 1850 as not sufficiently favorable to the South. He was appointed Secretary of the Interior by President Buchanan in 1857, and in December 1860, while still holding that office, he was appointed a commissioner from Mississippi to urge upon North Carolina the adoption of a secession ordinance. In January 1861 he resigned from the Cabinet in consequence of the action of President Buchanan in sending reinforcements to Fort Sumter, which he declared to be a violation of an understanding with the Cabinet that the order should not be given without the knowledge of that body. He took an active part in the subsequent secession movement, was governor of Mississippi in 1862–4, and later served as aide to Gen. Beauregard and inspector-general for the department of Mississippi. He was Confederate commissioner to Canada in 1864, and a promoter of the plan to seize Chicago and release the prisoners at Camp Douglas near that city. He was accused of being the instigator of plots to burn various northern cities, also of complicity in the assassination of President Lincoln. A price was put upon his head and he fled to Europe. He returned to the United States, but was not brought to trial.

Thompson, James Maurice, American author: b. Fairfield, Ind., 9 Sept. 1844; d. 15 Feb. 1901. He was educated in Georgia, and served in the Confederate army during the Civil War. Afterward he settled in Indiana and practised law and civil engineering at Crawfordsville. Out-door life was his passion, and from 1885 to 1889 he was State geologist of Indiana and chief of the department of Natural History. His books are the records and observations of a nature-lover rather than a scientist, the product of his trips to the lake and swamp regions of Florida and Louisiana and to the hills of Alabama, Mississippi, and Georgia. He was expert with the bow and arrow, with which he hunted instead of a gun. Hence the title of one of his books, 'The Witchery of Archery' (1878).

Thompson, Sir **John David Sparrow,** Canadian jurist and for some time premier of the Dominion: b. Halifax 10 Nov. 1844; d. Windsor, Eng., 12 Dec. 1894. His father, who had come from Waterford, Ireland, held the office of queen's printer. Thompson was educated at the common school, Halifax, and was called to the bar in that city in 1865. He joined the Roman Catholic Church in 1871. After holding several municipal offices, he was elected to the Nova Scotia assembly for Antigonish (1877). His success at the bar earned him the dignity of queen's counsel in 1879. He was attorney-general in 1878 and premier of the province in 1879. After the defeat of his government in the same year Thompson was made a judge of the supreme court of Nova Scotia. This position he resigned to accept the portfolio of minister of justice in Sir John A. Macdonald's cabinet (1885), entering the Dominion Parliament as member for Antigonish. He remained minister of justice until 1892, distinguishing himself by his oratorical power and his untiring industry. In 1887 he visited Washington as one of the commissioners on the fisheries question. The honor of knighthood was conferred on him in August, 1888. Sir John again visited Washington as one of the representatives of his government in the unsuccessful reciprocity negotiations of 1891 and 1892. He is understood to have been offered the position of premier on the death of Sir John A. Macdonald (1891), but preferred to remain as minister of justice under the leadership of Sir J. J. C. Abbott. On the retirement of the latter (Dec. 1892), Sir John Thompson became prime minister. His incessant parliamentary labors rapidly undermined his health and brought about his death under singularly tragic circumstances. Visiting England in 1894 to be sworn in as a member of the privy council, he expired suddenly of syncope almost immediately after the ceremony. Consult: Hopkins, 'Life and Work of the Rt Hon. Sir John Thompson.'

Stephen Leacock,
McGill University.

Thompson, John Polk, American inventor: b. Glasgow, Scotland, 1838; d. Olneyville, R. I., 16 Sept. 1899. At 26, having emigrated to America and been educated in the public schools here, he became overseer in the carding department of the Sprague Mills at Baltic, Conn. During his life he was superintendent successively of mills at Fall River, Mass., Phœnix, Md., Olneyville, R. I., and Memphis, Tenn. His inventions, at least 14 in number, include carding appliances, stop and let-off motions, and self-thread-

ing shuttles, and have produced radical improvements in manufacturing methods.

Thompson, Launt, American sculptor: b. Abbeyleix, Ireland, 8 Feb. 1833. He arrived in the United States 1847, and began his study of sculpture under Erastus Dow Palmer in Albany. In 1850 he removed to New York where he became an associate of the Academy of Design in 1859; an academician in 1862; and vice-president in 1874. He traveled for several years in Italy and finally settled in New York. His works include 'Elaine' (a bust); 'Morning Glory' (a medallion); statues of Abraham Pierson at New Haven, Conn., and of Winfield Scott, at Washington, D. C.; portrait busts of William C. Bryant, Edwin Booth as Hamlet, Charles L. Elliott, etc.

Thompson, Mortimer M., American journalist and humorist: b. Riga, N. Y., 2 Sept. 1832; d. New York 25 June 1875. He was educated at the University of Michigan, was for a time connected with the stage, settled in New York in 1852, and shortly after began writing there for the press. He subsequently became a popular lecturer, and continued humorous contributions to the weekly newspapers. His books, written under the pseudonym of "Q. K. Philander Doesticks, P.B." ("Queer Kritter, Philander Doesticks, Perfect Brick"), include: 'Doesticks — what he Says' (1855); 'Plu-ri-bus-tah' (1856), a travesty of Longfellow's 'Hiawatha'; 'Nothing to Say' (1857); and others.

Thompson, Richard Wigginton, American lawyer: b. Culpeper County, Va., 9 June 1809; d. Terre Haute, Ind., 9 Feb. 1900. He was admitted to the bar of Lawrence County, Ind., in 1834. He served in both houses of the State legislature, and in 1841 was elected to Congress. He declined an appointment as minister to Austria in 1849, and later the post of solicitor-general of the Land Office, which President Fillmore offered him. In 1867 he became judge of the 5th Indiana Circuit Court, and in 1877–81 was Secretary of the Navy. He resigned this post before the completion of his term in order to become chairman of the American committee of the Panama Canal Company. He published: 'The Papacy and the Civil Power' (1877); 'History of the Protective Tariff' (1888); 'Footprints of the Jesuits' (1894); and 'Recollections of Sixteen Presidents, from Washington to Lincoln' (1894).

Thompson, Robert Ellis, American educator: b. near Lurgan, Ireland, 5 April 1844. He was graduated at the University of Pennsylvania in 1865, and from 1868 to 1892 held successively in that institution professorships in Latin and mathematics, social science, history, and English literature. He has held lectureships at Harvard, Yale, and Princeton Theological Seminary, and has contributed editorially to the 'Penn Monthly,' the 'American Weekly,' and the 'Sunday School Times.' In 1874 he was ordained to the Presbyterian ministry. His publications include: 'Social Science and National Economy' (1875); 'De Civitate Dei'; 'The Divine Order of Human Society' (1891), being his Stone lectures at Princeton; 'History of the Presbyterian Churches of America' (1895); 'Protection to Home Industry' (1885), being his Harvard lectures; and 'The Hand of God in American History' (1902). He has edited Duffield's 'Latin Hymn-writers and Their Hymns' (1889).

Thompson, Silvanus Phillips, English physicist: b. York 19 June 1851. He was educated at Bootham School, York, at Flounders' Institute, Pontifract, and at the Royal School of Mines. In 1876–85 he held the professorship of experimental physics at University College, Bristol, and has since been principal and professor of physics in the City and Guilds Technical College, Finsbury. He has been president of the Physical Society; of the Institution of Electrical Engineers; and of the Röntgen Society. He has written a work on 'Michael Faraday' (1898), and technical works on electricity, including treatises on dynamo-electric machinery and the electro-magnet.

Thompson, Smith, American jurist: b. Stanford, N. Y., 17 Jan. 1768; d. Poughkeepsie, N. Y., 13 Dec. 1843. He was graduated at Princeton in 1788, admitted to the bar in 1792, and several years later established a law practice in New York. He was chosen to the legislature in 1800, was associate justice of the State Supreme Court in 1802–14, chief justice in 1814–18, served as Secretary of the Navy under President Monroe, and from 1823 until his death was a justice of the Supreme Court of the United States.

Thompson, Vance, American journalist and playwright: b. Cincinnati, Ohio, 17 April 1863. He was graduated from Princeton in 1883, studied in Germany, was a dramatic critic in New York in 1890–7, and was editor and founder of 'M'lle New York.' His dramas include 'In Old Japan'; 'Floriane's Dream'; etc., and among his books are 'Berwyn Kennedy'; and 'French Portraits: Being Appreciations of the Writers of Young France' (1900).

Thompson, Waddy, American lawyer: b. Pickensville, S. C., 8 Sept. 1798; d. Tallahassee, Fla., 23 Nov. 1868. He was graduated at the South Carolina College in 1814, admitted to the bar in 1819, and in 1826–30 served in the State legislature. He became solicitor of the Western Circuit in 1830, was elected brigadier-general of militia at the time of the Nullification excitement, and in 1835–41 was a Whig member of Congress. In 1840 he was chairman of the Committee on Military Affairs. He was appointed minister to Mexico in 1842, and while on this mission concluded two important treaties and procured the liberation of more than 200 Texan prisoners. He published 'Recollections of Mexico' (1846).

Thompson, Conn., town, in Windham County; on the French and Quinebaug rivers, and on the New York, New Haven & Hartford railroad. Within the town limits are the villages of Grosvenor Dale, North Grosvenor Dale, New Boston, Thompson, East Thompson, West Thompson, Wilsonville, Mechanicsville, and Quinebaug. It is in an agricultural region. The chief manufacturing establishments are cotton and woolen mills, flour and grist mill, planing mills, boot and shoe factory, and machine shops. Pop. (1890) 5,580; (1900) 6,442.

Thompson Indians. See SALISHAN.

Thompson's Station, Battle of. After the battle of Stone River (q.v.) the Confederate cavalry were active on Rosecrans' flanks and rear, and late in February 1863 Gen. Earl Van Dorn, with over 6,000 men, crossed the Tennes-

see River at Florence and marched northward to Columbia, on Duck River, threatening Franklin, about 28 miles nearly west of Murfreesboro. On 4 March Gen. Rosecrans ordered a general reconnoissance in front of his lines to ascertain the Confederate strength, and if possible, the enemy's intention. One of these reconnoitering columns was sent from Franklin. It was under command of Col. John Coburn, and consisted of his brigade — 33d and 85th Indiana, 19th Michigan, and 22d Wisconsin — the 124th Ohio, 600 cavalry under Col. T. J. Jordan and Aleshire's Ohio battery of six guns; in all 2,837 officers and men. A train of 101 wagons accompanied the expedition, 80 of which were to collect forage. Coburn was instructed to advance the first day to Spring Hill, where he was to halt for the night of the 4th, and next day divide his force, sending part of it to Rally Hill, on the left, to meet a co-operating cavalry column from Murfreesboro, and the other part toward Columbia, each to return to Spring Hill at night, unless the detachment at Rally Hill should be joined by the cavalry expected from Murfreesboro. Col. Jordan, with the cavalry and battery, led the advance and when three miles out of Franklin, met Gen. W. H. Jackson's cavalry division of two brigades and King's battery moving north. Both parties formed for battle, Aleshire opened with his guns, King's guns replied, the skirmishers became engaged, and after a brisk engagement of an hour Jackson withdrew toward Spring Hill, and Coburn went into camp four miles south of Franklin. One of Aleshire's guns had been disabled and with the forage train of 80 wagons, half of them loaded, was sent back to Franklin. Van Dorn had started from Columbia that morning with the five brigades of Gens. N. B. Forrest, W. T. Martin, G. B. Cosby, F. C. Armstrong, and Col. J. W. Whitfield, 6,000 men and 12 guns, and when Jackson with the two brigades of Armstrong and Whitfield fell back after the engagement, Van Dorn formed line at Thompson's Station, nine miles south of Franklin, and awaited Coburn's advance. Jackson's division was posted on a range of hills crossing the Franklin pike, with King's battery on the extreme left and Forrest's brigade, with a battery, was on Jackson's right. On the morning of the 5th Coburn advanced cautiously and on nearing Thompson's Station Jordan charged with his cavalry, drove a small Confederate force from the station, and seized a range of hills near it. Coburn followed with the infantry to near the station, when, on entering a pass, with hills on either side, he was arrested by shells from the Confederate artillery on his right and left, enfilading his line. It was necessary to dislodge King's battery on his right and he formed his line for the attack; Aleshire's guns on opposite sides of the turnpike and railroad, which ran close to each other, the guns supported by the cavalry, and the 33d and 85th Indiana advanced down the hill against King's battery, when suddenly the Confederate guns ceased firing and from behind a stone wall Whitfield's brigade, reinforced by a regiment of Armstrong's, opened a fire that drove the two regiments back up the hill. Whitfield followed, and when nearing the summit, he was charged and driven back, made a stand behind the depot of Thompson's Station and with the assistance of two of King's guns compelled Coburn's men to fall back beyond the hill. At about the same time Coburn was informed that about 1,000 cavalry had been discovered on the left, and he resolved to retreat; but it was first necessary to check the Confederate advance. The movement in retreat was to be covered by the battery and the cavalry, but when Jordan saw the signs of a movement in retreat, and the probability of being cut off by Forrest's cavalry on the left, he ordered the wagon train and its guard to the rear, to be followed by the battery, Jordan following the battery after a slight resistance to Forrest. Meanwhile Armstrong and Whitfield had been ordered to assault Coburn's left and Forrest to reach his rear. Armstrong, Whitfield and part of Forrest charged, and after a fierce struggle for the crest of the hill were again driven from it with great loss. Again the Confederates charged; Coburn was forced back; Forrest, with two regiments, gaining his rear, charged him; and after a few volleys at close quarters Coburn surrendered. His loss, as officially reported, was 48 killed, 247 wounded, and 1,151 captured or missing. Van Dorn's loss was 56 killed, 289 wounded, and 12 missing. Meanwhile other columns had pushed out from Murfreesboro and driven other bodies of Confederate cavalry across Duck River, and Gen. Gordon Granger, commanding the reserve corps of Rosecrans' army, upon hearing of Coburn's defeat, strengthened Franklin and concentrated a column at that place to move upon Van Dorn, at Spring Hill and Thompson's Station. Granger moved on the 9th, attacked and drove Armstrong's cavalry brigade from Thompson's Station and advanced to Spring Hill; Van Dorn having fallen back during the day to recross Duck River at Columbia. On the next day Granger's cavalry pushed Armstrong across Rutherford's Creek near Columbia; and Van Dorn's main body recrossed Duck River. Pursuit was suspended and on the 11th the various commands engaged in the general reconnoissance returned to their former positions. Consult 'Official Records,' Vol. XXIII.; Van Horne, 'History of the Army of the Cumberland,' Vol. I.; Wyeth, 'Life of Gen. N. B. Forrest.'

E. A. Carman.

Thomson, tŏm'sŏn, **Charles**, American patriot: b. Maghera, County Derry, Ireland, 29 Nov. 1729; d. Lower Merion, Pa., 16 Aug. 1824. He came to America in 1740, was educated in the academy at Thunder Hill, Md., and became a teacher in the Friends' Academy, Newcastle, Del., afterward taught in Philadelphia, and then engaged in business in that city. He acted as commissioner among the Indians, and in 1756 was adopted into the Delaware tribe as the "Truth Teller." From the first he ardently espoused the cause of the Colonies, and in 1774 was made secretary of the Continental Congress, a post he occupied until 1789. Upon Washington's election to the Presidency he was sent to Mount Vernon to inform him of the event. He then retired from public life, and afterward occupied himself with literary labors. He published: 'An Enquiry into the Causes of the Alienation of the Delaware and Shawanese Indians' (1759); 'The Holy Bible, containing the Old and New Covenant, translated from the Greek [the Old Covenant from the Septuagint]' (1808); and 'A Synopsis of the Four Evangelists' (1815).

Consult Harley, 'The Life of Charles Thomson' (1900).

Thomson, Sir Charles Wyville, Scottish naturalist: b. Bonsyde, Linlithgow, 5 March 1830; d. there 10 March 1882. He was educated at the University of Edinburgh, where he took the medical course and showed great ability in botany and natural history. He was appointed lecturer on botany in King's College, Aberdeen, in 1850, and professor at Marischal College in 1851. He filled the chair of natural history in Queen's College, Cork, in 1853, and in 1854 went to Queen's College, Belfast, as professor of mineralogy and geology. In 1860 he was transferred to the chair of natural science in the same college, and in 1868 became in addition professor of botany in the Royal College of Science at Dublin. He returned to Scotland in 1870 to become professor of natural history in the University of Edinburgh. He took an active part in the scientific investigation of the British seas by the Lightning and Porcupine expeditions, and published 'The Depth of the Sea' (1873). He was appointed in 1872 chief of the scientific staff of the Challenger Expedition (q.v.), and on its return in 1876 was knighted. In 'The Voyage of the Challenger: the Atlantic' (1877) he gave a general account of part of the investigations carried out in the famous voyage.

Thomson, Edward, American Methodist Episcopal bishop: b. Portsea, England, 12 Oct. 1810; d. Wheeling, W. Va., 22 March 1870. He came to the United States in 1819, was graduated in medicine at the University of Pennsylvania in 1829, and practised in Jeromeville and Wooster, Ohio. In 1832 he united with the Methodist Church, and in the following year was admitted into the Ohio Conference. He was pastor of a church in Detroit, Mich., in 1836, and in 1838–43 was principal of the Norwalk Seminary. He was the first president of the Ohio Wesleyan University at Delaware, in 1846–60, and in 1864 he was elected bishop, in which office he continued until his death. He edited the 'Ladies' Repository' at Cincinnati 1844–6, the 'Christian Advocate and Journal,' New York 1860–4, made a missionary tour of the world, and published: 'Moral and Religious Essays' (1856); 'Sketches, Biographical and Incidental' (1856); 'Our Oriental Missions' (1870); 'Evidences of Revealed Religion' (1872); and other works.

Thomson, Elihu, American inventor and electrician: b. Manchester, England, 29 March 1853. In 1858 he came to the United States, was educated in the public schools in Philadelphia, and from 1870 to 1880 was professor of chemistry and mechanics in the Central High School there. After a visit to the Paris Exposition in 1878 he became interested in the subject of lighting by electricity, and his experiments carried on with the aid of E. J. Houston, resulted in patents secured in 1878 and 1879. The following year he became electrician to the American Electric Company, afterward known as the Thomson-Houston Electric Company. This, by consolidation with the Edison Company in 1892, became the General Electric Company, the largest plant for producing electrical machinery in the world. His patented inventions in electrical appliances number over 600, and many of them have come into universal use. Among these are the three-coil armature for dynamos and motors; the induction-coil system of distribution; the induction motor; the constant current regulator for arc-lighting dynamos; the process of welding metals by electricity; the magnetic blow-out for switches and fuses, and the electric meter for direct and alternating currents. Since 1892, when the General Electric Company established its plant in Lynn, Mass., he has resided there, retaining his connection as consulting electrical engineer. In 1889 he became president of the American Institute of Electrical Engineers; and in 1890 received from the Paris commission half the prize of 10,000 francs for his meter. The grand prize and the cross of the Legion of Honor were awarded him at the Paris Exposition in 1889. Among the most notable of his papers prepared for scientific societies are that on 'Electric Welding,' read before the Boston Society of Arts in 1886, and one prepared for the American Institute of Electrical Engineers in 1887, on 'Novel Phenomena of Alternating Currents.'

Thomson, Frank, American engineer and railroad president: b. Chambersburg, Pa., 5 July 1841; d. Merion, Pa., 5 June 1899. As a student he acquired a thorough practical and scientific knowledge of mechanical engineering, so that when he quitted the shops of the Pennsylvania Railroad at Altoona he was able to build a locomotive. As chief assistant to the assistant secretary of war, he constructed roads and bridges and superintended the transportation of troops during the Civil War; after which he was appointed superintendent of the eastern division of the Philadelphia & Erie Railroad. He reentered the service of the Pennsylvania Railroad in 1873, and as superintendent of the eastern system constructed the excellent road-bed and introduced the standard track. From 1897 until his death he was president of the company.

Thomson, George, Scottish song collector: b. Limekilns, Scotland, 4 March 1757; d. Leith, Scotland, 18 Feb. 1851. He was educated at Banff and in 1780 removed to Edinburgh where he became junior clerk to the Board of Trustees for the Encouragement of Arts and Manufactures. He was subsequently promoted to be chief clerk, an office he held until his retirement in 1839. In 1792 he conceived the plan of making a complete collection of Scottish airs, secured the services of such well-known authors as Campbell, Scott, and Burns to supply words for the melodies where necessary, and since there was neither prelude nor coda to the songs he engaged Pleyel, Haydn, Beethoven, Mozart, and others of note to remedy the deficiency and also to compose accompaniments for them. The results of his labors were published as follows: Scottish airs (6 vols. 1793–1841); Welsh (3 vols. 1809–14); and Irish (2 vols. 1814–16).

Thomson, James, Scottish poet: b. Ednam, Roxburghshire, 11 Sept. 1700; d. Richmond, Surrey, 27 Aug. 1748. He was educated at the University of Edinburgh in 1715, and at first intended to enter the ministry, but in 1725 went to London to devote himself to literature. His poem on 'Winter' was published in the following year, in 1727 it was followed by 'Summer,' 'Spring' appeared in 1728, and in 1730 the series was completed and published as 'The Seasons.' It was very successful and was fol-

lowed by his play 'Sophonisba,' produced at Drury Lane in 1730. For two years he was on the Continent as traveling tutor to the son of Charles Talbot, a future lord chancellor, and after the death of his pupil in 1733 was appointed by the young man's father to a sinecure office with a salary of £300 a year. He published a patriotic poem entitled 'Liberty' (1734–6), included in 1736 in the volume with 'Sophonisba' and 'Britannia.' His famous song, 'Rule Britannia,' formed part of 'The Masque of Alfred' (1740), written by him with his friend David Mallet, to music composed by Dr. Arne. In 1744 Lord Lyttelton conferred upon him the sinecure office of surveyor-general of the Leeward Islands, worth £300 a year. In the same year he issued a new edition of 'The Seasons' with extensive additions and alterations, and in 1748 appeared 'The Castle of Indolence: An Allegorical Poem,' a fine imitation of Spenser. He was buried in the parish church of Richmond. Among his works not already mentioned are: 'Agamemnon' (1738), a play; 'Edward and Eleanora' (1739), a play which was published but rejected by the censor; 'Tancred and Sigismunda' a tragedy (1745), his most successful play; and 'Coriolanus' (1749), a posthumously acted play. 'The Seasons' marks the dawn of a new era in English poetry, an era characterized by a departure from the formalism and artificiality of Pope and his school in favor of simplicity and truthfulness to nature. The impulse gathered strength in Gray and Cowper, and reached its fullest expression in Wordsworth. The work found warm admirers in France and other countries and is still read. A good recent edition of Thomson's works is the Aldine (1897) by Tovey. Consult: Morel, 'James Thomson, sa Vie et ses Œuvres' (1895); 'Life' in Tovey's edition; Bayne, 'Thomson' ('Famous Scots' series, 1898).

Thomson, James, British professor of engineering: b. Belfast 16 Feb. 1822; d. Glasgow 8 May 1892. He was brother of William Thomson, Lord Kelvin, and was graduated from the University of Glasgow in 1839. In 1851 he settled at Belfast as civil engineer, and in 1857 became crown professor of civil engineering at Queen's College. Here he remained until 1873, when he was called to the similar chair at Glasgow. In early life he was devoted to various inventive purposes, his first being a mechanism for feathering the floats of steamer paddles. Afterward he invented a boat that could be propelled against a current by means of legs that reached to the bottom, as well as by paddles. More practical was his invention in 1850 of a "vortex water-wheel," and later of a jet-pump used in draining lowlands, a centrifugal pump, and improvements in turbines and in the action of blowing-fans. For many years he was engaged in investigations of the plasticity of ice, his first contribution to the subject (1848) being a paper communicated to the Royal Society of Edinburgh on 'The Effect of Pressure in Lowering the Freezing-point of Water.' The most important of his contributions to this subject dealt with "crystallization and liquefaction as influenced by stresses tending to change of form in crystals." He also published researches on currents of atmospheric circulation; on the flow of water in rivers, and on the jointed prismatic structure seen at the Giants' Causeway. Failure of eyesight caused him to resign his chair in 1889.

Thomson, James, Scottish poet: b. Port-Glasgow 23 Nov. 1834; d. London 3 June 1882. He was trained at Chelsea for the calling of army schoolmaster, and after teaching at various regimental centres was discharged from the army with several others for a breach of discipline in 1862. He had gained the friendship of Charles Bradlaugh (q.v.) and contributed to his 'National Reformer' over the signature B. V. In 1872 he was in Colorado as agent of a mining company, and in the following year went to Spain as a war correspondent for the New York *World*. In 1874 (March to May) he contributed to the 'National Reformer' his most famous poem, 'The City of Dreadful Night' (printed in book form, with other poems, 1880), a finished, sombre work, in which his gloomy temperament clearly shows itself. His other publications include: 'Vane's Story, Weddah and Om-el-Bonain, and other Poems' (1881); 'Essays and Phantasies' (1881); 'A Voice from the Nile, and other Poems' (1884); 'Satires and Profanities' (1884); and 'Poems, Essays, and Fragments' (1892). His 'Poetical Works' were issued in two volumes in 1895, and a volume of 'Biographical and Critical Studies' appeared in 1896. Consult the 'Life' by Salt (1889; revised edition, 1898); also Ward, 'English Poets,' 2d ed., Vol. IV. (1883).

Thomson, John, Scottish painter: b. Dailly, Ayrshire, 1 Sept. 1778; d. Duddingston 30 Oct. 1840. He studied for the ministry in Glasgow University for a year, in 1793 entered the University of Edinburgh, and on his father's death in 1799 succeeded him as minister of his native parish. In 1805 he was presented to the parish of Duddingston, near Edinburgh, and here he rapidly acquired fame as a landscape-painter. His pictures were much in demand, and he exhibited frequently in Edinburgh. On the foundation of the Scottish Academy in 1830 he was elected an honorary member, after declining ordinary membership. Many of his pictures are in the National Gallery of Scotland, but a considerable number are hung in private collections. Among the former are: 'Bruce's Castle of Turnberry'; 'Ravensheugh Castle'; 'Scene on the Clyde'; 'The Trossachs'; 'Aberlady Bay'; and 'Trees on the Bank of a Stream.' The National Gallery in London contains 'Loch an Eilan,' and the South Kensington Museum has a water-color of 'Duddingston Loch.' He felt throughout his artistic life the want of early and systematic training, but he holds a distinct place in the history and development of British art, as the first painter to grasp and express the wildness and power of Scottish scenery. Consult Baird, 'John Thomson' (1895).

Thomson, Joseph, Scottish explorer in Africa: b. Penpont, Dumfriesshire, 14 Feb. 1858; d. London 3 Aug. 1895. He was educated at the University of Edinburgh, and there distinguished himself so highly that he was appointed in 1878 geologist and naturalist to the exploring expedition sent out to East Central Africa by the Royal Geographical Society under the command of Alexander Keith Johnston.

When Johnston died, 28 June 1879, Thomson assumed the leadership of the party and conducted it to Lake Tanganyika and near the head-waters of the Kongo. A mutiny of his followers prevented him from proceeding farther, and he returned by way of Lake Leopold, reaching the coast 10 July 1880. In 1882 he set out on a great journey from the east coast of Africa to Victoria Nyanza. This was undertaken on behalf of the Royal Geographical Society, and during it he visited Kilimanjaro and Mount Kenia, and proceeded through the country of the Masai by way of Lakes Naivasha and Baringo to Victoria Nyanza. In 1885 he was awarded the founder's medal of the Royal Geographical Society, and in the same year traveled in Nigeria on behalf of the National Africa Company in order to conclude treaties with the kings of Sokoto and Gando. In 1888 he explored the Atlas Mountains in Morocco, and in 1890–1 traveled on behalf of the British South Africa Company in the territory of the Central Africa Protectorate. His travels are described in his works: 'To the Central African Lakes and Back: the narrative of the Royal Geographical Society's East Central African Expedition, 1878–80' (1881); 'Through Masai Land: a Journey of Exploration Among the Snowclad Volcanic Mountains and Strange Tribes of Eastern Equatorial Africa' (1885); 'Travels in the Atlas and Southern Morocco: a Narrative of Exploration' (1889). He also wrote a work on Mungo Park and the Niger (1890) and a novel 'Ulu,' with Miss Harris-Smith, in which he presents a psychological study of the native African mind. Consult 'Life' by his brother, J. B. Thomson (1896).

Thomson, Joseph John, English physicist: b. Manchester 18 Dec. 1856. He was educated at Owens College, Manchester, and at Trinity College, Cambridge; was lecturer at Trinity in 1883, and since 1884 has been professor of experimental physics at Cambridge. He has published: 'A Treatise on the Motion of Vortex Rings' (1884); 'Recent Researches in Electricity and Magnetism' (1892); 'Elements of the Mathematical Theory of Electricity and Magnetism' (1895); 'Conduction of Electricity through Gases' (1903); etc.

Thomson, Thomas, Scottish antiquary, elder brother of Rev. John Thomas, the painter (q.v.): b. Dailly, Ayrshire, 10 Nov. 1768; d. Edinburgh 2 Oct. 1852. He was graduated from Glasgow University in 1789, and adopting law as his profession, went to Edinburgh, and was admitted an advocate in 1793. He acquired a large practice, but gradually devoted himself more and more to the study of legal antiquities. In 1832 he succeeded Sir Walter Scott, who was one of his close friends, as president of the Bannatyne Club. Among his numerous publications are: 'The Acts of the Parliament of Scotland, 1424–1707' (10 vols., 1814–24); 'Registrum Magni Sigilli Regum Scotorum, 1306–1424' (1814); 'The Acts of the Lords Auditors of Causes and Complaints, 1466–94' (1839), and 'Acts of the Lords of Council in Civil Causes, 1478–95' (1839); 'Forms of Process in the Court of Session during the Earlier Periods, with the later variations' (1839); 'Chamberlain Rolls' (three vols., 1817 and 1845); 'Memoirs of Sir George Mackenzie' (1821). Consult 'Memoir' (1854) by Cosmo Innes.

Thomson, Thomas, British chemist: b. Crieff 12 April 1773; d. near Holy Loch 2 July 1852. He was educated at Crieff, Stirling, and the University of Saint Andrews, and in 1799 graduated M.D. at Edinburgh. He edited the supplement to the third edition of the 'Encyclopædia Britannica,' to which he contributed the articles 'Chemistry,' 'Mineralogy,' and 'Vegetable, Animal, and Dyeing Substances.' In the article 'Mineralogy' he used the system of symbolic representation, but it is incorrect to describe him as the introducer of this auxiliary of chemical science. In 1800, on the completion of the 'Encyclopædia,' he began a course of lectures on chemistry, which he continued till 1811, opening, in addition, a laboratory for practical instruction in chemistry, about the first institution of the kind in Great Britain. In 1802 he published the first edition of his 'System of Chemistry,' which obtained rapid success both in Great Britain and on the Continent. In 1810 he published his 'Elements of Chemistry.' His 'History of the Royal Society' appeared in 1812. In 1813 he went to London and began there a scientific journal, the 'Annals of Philosophy,' which he continued to edit till the end of 1820. The lectureship in chemistry in the University of Glasgow was conferred on him in 1817, the office being shortly afterward raised to a professorship, and he himself created regius professor of chemistry in 1818. His work on the atomic theory was published in two volumes in 1825, under the title of 'Attempt to Establish the First Principles of Chemistry by Experiment.' The accuracy of the work was severely criticized by the Swedish chemist Berzelius. Thomson discovered a large number of chemical compounds, such as hyposulphurous acid, chlorochromic acid, and a great variety of salts. In 1830–1 he published his 'History of Chemistry,' and in 1836 appeared his 'Outlines of Mineralogy and Geology.' In 1846 he retired from his professional duties.

Thomson, William, English archbishop: b. Whitehaven 11 Feb. 1819; d. York 25 Dec. 1890. He was educated at Queen's College, Oxford, of which he was successively fellow, tutor, and head. Ordained deacon in 1842, he was curate at St. Nicholas, Guildford, and Cuddesdon, near Oxford, 1842–7, when he was made tutor of his college, of which he became provost in 1855. In 1861 he edited a series of essays by various writers under the title 'Aids to Faith,' intended as a counterblast to 'Essays and Reviews'; and in that year was appointed bishop of Gloucester and Bristol. In February 1863 he became archbishop of York. He was the author of: 'An Outline of the Necessary Laws of Thought' (1842); 'The Atoning Work of Christ, viewed in Relation to some Current Theories' (1853); 'Crime and its Excuses' (in Oxford Essays, 1855); 'Life in the Light of God's Word'; 'Limits of Philosophical Inquiry'; 'Design in Nature'; and a series of essays entitled 'Word, Work, and Will.'

Thomson, William, 1st Lord Kelvin, British mathematician and physicist: b. Belfast 26 June 1824. He was graduated from Cambridge in 1845, and even in 1841 gave proof of great mathematical ability by a paper 'On the Uni-

form Motion of Heat in Homogeneous Solid Bodies, and in Connection with the Mathematical Theory of Electricity,' contributed to the 'Cambridge Mathematical Journal.' In 1845 he became first editor of the 'Cambridge and Dublin Mathematical Journal,' a post which he held for seven years. He was appointed professor of natural philosophy in the University of Glasgow in 1846, and occupied this position for 53 years, till his resignation in 1899. His jubilee as a professor was celebrated in 1896 by many brilliant university functions, and distinguished men of science came from many countries to do him honor. Lord Kelvin's contributions to physical science and its applications are very numerous. In all the domains of dynamics, sound, light, heat, magnetism, and electricity there are achievements to his credit. The form in which the mariner's compass is now generally employed was patented by him in 1876, and the siphon recorder used in connection with almost all submarine cables was introduced by him in 1867. His extremely delicate mirror galvanometer was also originally invented for the purposes of submarine telegraphy, and in this connection his automatic curb sender is also worthy of notice. His quadrant and absolute electrometers are well known to the student of electrostatics, and his portable electrometer and water-dropping apparatus are of great use in practical meteorology. He has published important papers on the theory of magnetism, and the theory of electric images with the associated method of electric inversion is due to him. Lord Kelvin was the first to direct the attention of scientific men to Sadi Carnot's pioneer work in thermodynamics, and it is mainly to his researches and those of Rankine and Clausius that we owe the present advanced condition of that science. The absolute scale of temperature based on the second law of thermodynamics was first proposed by Lord Kelvin. In the building up of the great modern doctrine of the conservation of energy he has taken an important part, and the portion of that doctrine known as the dissipation of energy is almost entirely due to him. He has also propounded a modified atomic theory in which the atoms are conceived as vortices, and he has thrown much light on such questions as the age of the earth, cosmic evolution, and geological time. Lord Kelvin, then William Thomson, was associated as electrician with the company which undertook the laying of an Atlantic cable in 1857, and was largely responsible for the success which ultimately crowned this pioneer effort of submarine telegraphy in 1866. He might, indeed, be called the first electrical engineer. He was knighted in 1866, and in 1892 was raised to the peerage as Baron Kelvin of Netherall, Largs, Ayrshire. He has received many other honors from many lands. He was president of the Royal Society from 1890 to 1895, and has been awarded the Copley and Royal medals. In 1871 he presided over the meeting of the British Association at Edinburgh. He was Rede lecturer at Cambridge in 1866 and has been repeatedly elected president of the Royal Society of Edinburgh. He was awarded the Prix Poncelet by the Institute of France in 1874, and the Helmholtz medal by Germany in 1892. Lord Kelvin's most important published work is the well-known 'Treatise on Natural Philosophy' (part i., 1867; new ed. 1879), written with Prof. Tait. An abridged edition has also beeen published. His other works are: 'Papers on Electrostatics and Magnetism' (1873); 'Mathematical and Physical Papers' (1882, 1884, 1890); 'Popular Lectures and Addresses,' and articles in the 9th edition of the 'Encyclopædia Britannica,' some of which have been also published separately. He visited the United States in 1884, in 1892, and again in 1902.

Thom'sonite, one of the zeolite family of minerals. It usually occurs in columnar forms or radiated concretions of snow-white color; less frequently in distinct orthorhombic crystals (comptonite). It is a hydrous silicate of aluminum, sodium and calcium. It is found filling cavities in igneous rocks in Scotland, the Faroe Islands, Nova Scotia, at Golden in Colorado and elsewhere. Much so-called thomsonite, including the pebbles of Grand Marais, Minnesota, is mesolite.

Thor, thôr or tôr, in Norse mythology, the god of thunder, son of Odin by Jörd (the earth). He was represented as a powerful man in the prime of life, with a red beard, girt with his girdle of strength, and armed with his mighty hammer Miölnir ("the smasher"). Sacrifices were offered up to him under oaks. Thursday has its name from him. Consult Uhland, 'Der Mythus vom Thor' (1868).

Thoracic Duct, a vertical canal lying in front of the spine, and receiving the terminations of the lacteal and lymphatic vessels. It is the receptacle for the materials which go to renovate the blood, these materials being derived from the digestion of food and from the elaborated products of the lymphatic glands. And from the thoracic duct the chyle or nutrient matter is poured directly into the current of the circulation, the duct opening into the great veins (internal jugular and subclavian veins) lying at the root of the neck on the left side. A second and smaller lymphatic or thoracic duct lies on the right side of the body, and receives the contents of the lymphatics of the right arm and right side of the head. The chief thoracic duct is dilated at its lower extremity, at the junction of the loins and back, into the receptaculum chyli. The contents of the thoracic duct contain the elements of the blood already elaborated.

Thorah, tō'ra, or Torah, in Hebrew literature a definite commandment laid down by recognized authority. When used with the definite article the word refers specifically to the Mosaic law, and often to the Ten Commandments.

Thorax, that part of the trunk in higher vertebrates consisting of the bony structures which form the chest or cavity containing the heart, lungs, and other viscera. The term is also applied to those segments of the body in *Arthropoda* which lie between the head and the abdomen. Thus in insects there are three segments forming the thorax, named respectively the prothorax, mesothorax, and metathorax. The prothorax bears the first pair of legs, the mesothorax the second pair of legs and first pair of wings, while the metathorax bears the third pair of legs and second pair of wings. In crustaceans and spiders the head and chest segments are united together to form a single mass, named the cephalothorax. In man and higher

vertebrates the thorax is formed by the sternum or breast-bone in part, and by the ribs and spine, laterally and behind. In mammals alone is the thorax and its cavity completely shut off from the cavity of the abdomen by a complete diaphragm or midriff. See ANATOMY; OSTEOLOGY.

Thoreau, thō'rō, **Henry David,** American "poet-naturalist": b. Concord, Mass., 12 July 1817; d. there 6 May 1862. Graduated at Harvard in 1837, he began in that year the copious journal with which in 1850–60 he filled 30 manuscript volumes, did some teaching at Concord and on Staten Island, N. Y., appeared occasionally as a lyceum lecturer in Concord and other New England towns that chanced to call him, and until his death practised at intervals and with great skill his art of pencil-manufacture, making, Emerson said, as good an article as the best English. In 1839 he took the excursion recorded in 'A Week on the Concord and Merrimac Rivers,' which was published in 1849 in an edition of 1,000; the return of 700 as unsalable (1853) affording him the humorous boast that he had now a fair-sized library all of his own writing. In the course of the voyage there are many pauses for speculation and opinion, the result being less a narrative than a collection of essays and discussions. Chiefly for the preparation of this work, but also to undertake an experiment in simplicity of living, and to have opportunity for his observation of wild nature, he lived alone, in a house built by himself, from July 1845 to September 1847, at Walden Pond, not far from Concord village. There, too, he wrote several of his papers, and gathered material for his 'Walden, or Life in the Woods' (1854), the best known and probably the most nearly classic of his books. After this episode, which some folk professed to think very odd, "he preferred," says Emerson, "short work," building boats, grafting, surveying, and other odd jobs, writing meanwhile for current periodicals. In 1846, 1853, and 1857 he went to the Maine woods, and his accounts, partially printed in magazines in his lifetime, were posthumously collected in book form (1864), constituting what is perhaps, after 'Walden,' his most interesting work. Other jaunts to Cape Cod (1849) and Canada (1850) were also described. He refused in 1841 to pay taxes to a government concerned in slavery and war, and was jailed for a few hours. He was said to have aided the escape of fugitive slaves when at Walden. At any rate he sounded the bell to announce Emerson's first anti-slavery address at Concord, and on 30 Oct. 1859 made there a bold public defense of John Brown, later repeated in Boston. As a scientist, it is said that he made few discoveries. His exact knowledge in this domain, however, was gained at first hand, his works abound in interesting observation and fragments of natural history; notwithstanding that when he came to report nature he seems to have valued it largely for what it interpreted to him. He was much of a poet, but lacked metrical facility, and wrote little. Some of his work in verse, such as the 'Smoke,' which Emerson thought finer than anything of Simonides, is of a high order. In prose, despite exaggerations and other rhetorical defects, he attained greater certainty of expression. Throughout his writings there is a tonic quality which may in part arise from what John Burroughs, the chief later representative of the school of literary naturalists which Thoreau inaugurated, calls his "stimulating contrariness." There is a 'Riverside' complete edition (1893); an edition of the 'Letters' by Sanborn (1894). Consult also: Channing, 'Thoreau, the Poet-Naturalist' (1873; new ed. 1902); Sanborn's 'Life' (1882; 'American Men of Letters' series); the 'Lives' by Page (1877) and Salt (1890; 1896); an essay by Burroughs in 'Literary Values' (1903); and also lives of Emerson, A. Bronson Alcott, and Hawthorne.

Thorite, a rare but important mineral found almost exclusively in Norway. Theoretically it is an anhydrous thorium silicate, $ThSiO_4$, but all analyses show the presence of considerable water and more or less uranium, lead and iron. The variety orangite, which is of a bright orange to lemon-yellow color, is the richest known thorium ore, containing by analysis 71.65 per cent of thoria. Uranothorite has a dark reddish-brown color and contains nine to ten per cent of uranium sesquioxide. Thorite proper is black or very dark brown. It crystallizes in tetragonal crystals isomorphous with zircon, the usual habit being a square prism terminated by a square pyramid. Prismatic cleavage is distinct and the fracture is conchoidal. Its hardness is 4.5 to 5, and the specific gravity ranges from 4.2 in some uranothorite to 5.4 in some orangite. It is transparent in thin splinters to nearly opaque in large or altered masses. Its lustre is resinous, streak yellow to dark brown. Thorite was formerly one of the chief sources of supply of the rare earth thoria and is still of much value for that purpose, though its use has now been supplanted by monazite.

Tho'rium, one of the most valuable of the rare elements. It was discovered by Berzelius in a Swedish mineral and called by him "thorium" after the ancient Swedish god Thor. Found in the minerals thorite, orangite, euxenite, aureite, and in monazite sand. This latter substance is found in considerable quantity in Brazil and in North Carolina and is one of the most valuable sources of thorium and of a number of other rare elements related to it. Thorium, symbol Th, atomic weight 232, is a grayish metallic element that can be separated in an elementary condition by heating the chloride, $ThCl_4$, with metallic potassium or sodium. It is soluble in mineral acids and burns brilliantly to the oxide ThO_2, thoria, when heated in the air. This oxide is the most important compound of thorium as it is used together with the oxides of certain other rare elements to form the "mantles" for the Welsbach incandescent gas lights.

Thorn, tōrn, Germany, in Prussia, in the province of West Prussia, on the Vistula, 51 miles southwest of Marienbad. It is an important stronghold, surrounded by detached forts, and has withstood many heroic sieges. Its principal buildings comprise the ancient castle, town-house, and other gabled and handsome edifices; there is also a statue to Copernicus. Its manufactures include machinery, castings, soap, and a special gingerbread. There is considerable trade in corn and timber, besides wood, linen, hides, bark, and ashes. An important conference was held in 1645, to recon-

Henry D. Thoreau

cile Protestant and Catholic differences, presided over by German and Polish churchmen, but was far from meeting with success. Copernicus was born at Thorn. Pop. (1900) 29,626.

Thorn-apple. See DATURA.

Thorne, Joseph, American inventor: b. Marlboro, N. Y., 17 Feb. 1826; d. Sing Sing, N. Y., 4 May 1897. He served through the Mexican War. Becoming an engineer he associated himself with Elias Howe while the latter was perfecting his sewing-machine. Afterward he was connected with the Singer Company, and later established a factory in Scotland. He invented a typewriter, a sewing machine, and a typesetting and distributing machine, which bear his name.

Thornheaded Worms, or Acanthocephala, a group of parasitic roundworms (q.v.) of the genus *Echinorhynchus,* having the proboscis armed with a circle of hooks.

Thorn'hill, Sir James, English painter: b. Melcombe Regis 1675; d. Thornhill, Dorset, 13 May 1734. Queen Anne appointed him her sergeant-painter and he was much engaged in the decoration of palaces and public buildings, in which his chief works are to be found. Among his best efforts may be mentioned the dome of St. Paul's, Great Hall at Greenwich Hospital, and some rooms at Hampton Court. He also painted the altar-pieces at All Souls and Queen's Colleges, Oxford. His forte was in the treatment of allegorical subjects. He was confirmed in his position sergeant-painter by King George I. in 1720 and knighted in the same year. Hogarth clandestinely married Thornhill's daughter in 1729, and always expressed great admiration for that painter's works which show invention, even genius, although living critics have not confirmed the favorable verdict of George I. and his contemporaries.

Thorns and Spines in Plants, acute-pointed projections from the trunks, branches, or twigs of plants. A thorn arises from the wood of which it is an outgrowth, whereas a prickle or spine is an outgrowth of the bark, and can be removed when the bark is peeled off. The raspberry and the rose are good examples of prickle-covered plants; the hawthorn and some wild plums of plants covered with thorns. Prickles and spines are believed to be useful to the plants which bear them, either as protections against the browsing of animals, as auxiliaries in climbing, holding their position, etc.; thorns are considered to be abortive branches, a deduction based upon the facts that in nature they often bear leaves, and under domestication may develop into branches. Various hawthorns exhibit the former phenomenon, and the apple and pear the latter.

Thorn'ton, Sir Edward, English diplomat: b. London 13 July 1817: d. there 26 Jan. 1906. He was educated at King's College, London, and at Cambridge University and in 1842 was appointed *attaché* at Turin. He was engaged in important diplomatic missions to Mexico and the South American states in 1845–65, and in 1865–7 was minister to Brazil. In 1867 he was appointed minister to the United States, served on the commission to adjust the Alabama Claims in 1871, and was arbitrator in the commission on the United States and Mexican claims in 1873. He became ambassador to Russia, in 1881, to Turkey in 1884, and in 1887 retired from the diplomatic service.

Thornton, Matthew, American legislator, signer of the Declaration of Independence: b. Ireland 1714; d. Newburyport, Mass., 24 June 1803. He came with his parents to America in 1717, lived for a time at Wiscasset, Maine, removed to Worcester, Mass., and there received his education. Entering the profession of medicine, he practised at Londonderry, N. H., and in the Louisburg expedition under Sir William Pepperell (1745) served as surgeon. He presided over the provincial convention of 1775; in 1776 became a delegate to the Continental Congress; and although he did not take his seat until November, and had not been elected when the Declaration of Independence was adopted, he was granted the special privilege of signing it. He had already been chief justice of the court of common pleas in New Hampshire when in 1776 he was made a judge of the Supreme Court, and this office he held until 1782.

Thorn'ycroft, John Isaac, English engineer and naval architect: b. Rome, Italy, 1 Feb. 1843. He was graduated from the engineering department of Glasgow University and studied shipbuilding at Govan on the Clyde. He became a builder of torpedo boats and has constructed many such boats for English and other European governments. He is the inventor of the turbine-propeller for use in shallow-draft vessels.

Thornycroft, Mary, English sculptor: b. Thornham, Norfolk, 1814; d. London 15 Feb. 1895. She was educated by her father, John Francis, and exhibited several pieces of sculpture at the Royal Academy; in 1840 she was married to Thomas Thornycroft, a fellow pupil, and with him went to Rome for study. In 1843 the queen commissioned her to model a statuette of the Princess Alice, which was so successful, that she received many other commissions from the royal family. She was especially successful in her portraiture of children, Among her works are: 'A Sleeping Infant' (1836); 'The Orphan Girl' (1838); 'A Girl Skipping' (1855); 'A Young Girl' (1868); 'A Young Cricketer' (1864); 'The Duchess of Edinburgh' (1877).

Thornycroft, William Hamo, English sculptor: b. London 9 March 1850. He received his education at University College School, London, and entered the Royal Academy schools in 1869. He first exhibited at the academy in 1871, and in the same year went to Italy. He gained a gold medal from the Academy in 1875 for a group representing 'A Warrior Bearing a Wounded Youth from the Field of Battle,' and in 1880 he completed his 'Artemis' for the Duke of Westminster. He became R.A. in 1888, He was made an honorary member of the Royal Academy of Munich in 1889, and he received a *médaille d'honneur* at the Paris Exhibition of 1900. His principal works include, in addition to those mentioned: 'Teucer' (1881), now in the Tate Gallery; 'The Mower' (1884); a memorial of the poet Gray (1885) at Pembroke College, Cambridge; a bust of S. T. Coleridge (1885); in Westminster Abbey; 'The Sower' (1886); a memorial of Sir John Goss in the

crypt of St. Paul's Cathedral; the National Memorial to General Gordon in Trafalgar Square, London; 'Medea' (1888); a statue of John Bright (1890) in Rochdale; 'The Mirror' (1890), his diploma work; 'Summer' (1893); 'The Joy of Life' (1896); a monument of W. O. Stanley at Holyhead (1897); 'The Bather' (1898); 'Lot's Wife'; and many monumental statues, including those of Queen Victoria, Archbishop Thomson (York Minster), and W. E. Gladstone (1902). The style of this sculptor shows a return from pictorial realism toward the severity of Greek idealism. His woman forms are characterized rather by strength and grandeur than the meretricious prettiness of the fleshly school. His monumental statues, the best of which is that of Gordon, are some of the noblest in English art, and his heroic figures, such as 'Teucer,' are instinct with life, while exhibiting something of the purity of line and classic grace which belong to the Periclean age of sculpture.

Thoroddsen, thôr'ōd-sĕn, **Thoravld,** Icelandic physicist: b. Flatey, Breidifjord, West Iceland, 6 June 1855. He was educated at the College of Reykjavik and the University of Copenhagen, and was a teacher at the first named institution 1885–95. Since the last named date he has resided in Copenhagen, spending his summers in Iceland, and has made a geological survey of the entire island. Among his publications are: 'History of Icelandic Geography' (1892–1902); 'Geological Map of Iceland' (1901); 'Earthquakes in Iceland' (1899); 'History of Icelandic Volcanoes' (1882).

Thorogum'mite, a rare mineral found only in Llano County, Texas. It is essentially a hydrated thoro-silicate of uranium, containing also ceria, yttria, lead, etc. It is regarded as made up of three molecules of thorite, linked with one of uranic oxide. It is highly valuable as an ore of uranium and thorium. It occurs massive or in crude crystals resembling thorite in form. Its color is dull yellowish-brown; hardness, 4 to 4.5; specific gravity, 4.43 to 4.54.

Thoroughwort. See EUPATORIUM.

Thorpe, Francis Newton, American author: b. Swampscott, Mass., 16 April 1857. He was educated at Syracuse University and at the University of Pennsylvania Law School, and has published: 'The Government of the People of the United States' (1889); 'Franklin and the University of Pennsylvania' (1893); 'The Government of the State of Pennsylvania' (1894); 'A (Social and Industrial) History of the American People' (1901); 'The Spoils of Empire' (1903); etc.

Thorpe, John, English architect: b. about 1540. Little is known about the particulars of his life excepting that during the 16th century he was the most eminent designer of buildings in the so-called Elizabethan style. Among the examples of domestic architecture which are attributed to him are Kirby House in Northamptonshire (1570); Burleigh, Holdenby, Audley End, the Strand front of Somerset House, and many other edifices. In the Sloane Museum is a collection of his drawings, etc., of unique interest.

Thorpe, Rosa Hartwick, American author: b. Mishawaka, Ind., 18 July 1850. She was graduated from the High School, Litchfield, Mich., in 1868, and was married to E. C. Thorpe in 1871. She is widely known by her poem 'Curfew Shall not Ring To-night.' She has published among other works: 'Fred's Dark Days' (1881); 'The Year's Best Days' (1889); 'Ringing Ballads' (1887); 'Sweet Song Stories' (1898).

Thorwaldsen, tôr'wâld-sĕn, **Albert Bartholomew (Bertel),** Danish sculptor: b. Copenhagen 19 Nov. 1770; d. there 24 March 1844. His father, an Icelander, was employed in the royal dockyard at Copenhagen in cutting figure-heads for vessels, and little Thorwaldsen's first employment was in helping his father. In his 11th year he entered the Academy of Arts, where he gained in 1793, along with a medal, the privilege of studying three years abroad. He resolved to visit Rome, where he arrived in November 1797, and under the inspiration of Canova and Carstens the painter devoted himself to reproducing that ideal beauty of ancient statuary, which became ever after the one object of his artistic life. It was not until 1803 that he became at all widely known. He had finished a model of Jason without finding a purchaser, when the well-known and wealthy Thomas Hope called at his studio and arranged with him to have it executed in marble. The fortune of its designer was now made. Commissions flowed rapidly in upon him, new creations from his hand followed in quick succession, and his abilities as a sculptor became everywhere recognized. In 1819 he returned to Denmark, and his journey through Germany and his reception at Copenhagen bore the appearance of a triumph. His first works in this city were the busts of the king and queen. He was next employed by the commissioners for the rebuilding of the Fruekirke or Church of Our Lady, to design the decorations for the same, which now form its main ornament. In 1820 he returned to Rome, visiting on his way Berlin, Dresden, Warsaw, and Vienna, and receiving numerous orders for works. He remained at Rome till 1838, when he undertook another journey to Copenhagen, being principally moved to this step by the contemplated establishment in that city of a museum of his works and art treasures. His return was a true national festival, both for Copenhagen and the whole of Denmark. With the exception of a short visit to Rome the remainder of his life was spent in the Danish capital, and he both took a vivid interest in the establishment of the Thorwaldsen Museum (q.v.) and enriched it by important contributions. Consult: Thiele, 'Thorwaldsen's Biographie' (1856); Plon, 'Thorwaldsen sa Vie et ses Œuvres' (1867); both of these works have been translated into English; Hammerich, 'Thorwaldsen und seine Kunst' (1876).

Thorwaldsen Museum, a building and art collection at Copenhagen raised from funds left by the sculptor Thorwaldsen. The building was constructed after a plan furnished by the architect Bindesböll, and is purely Greek in style. It contains the models and works bequeathed by the sculptor to his native city, which comprise 80 statues from his hand; three long alto-relievos and 130 busts. In the centre of the building is the highly decorated tomb of Thorwaldsen. The museum was opened in 1846.

Thoth, thŏth or tōt, an Egyptian deity identified by the Greeks with Hermes. He was

originally the moon-god, and the invention of letters, arts, and sciences was attributed to him. The ibis was sacred to him and he is represented with the head of that bird. The dog-headed ape is also one of his attributes, and he is frequently depicted with a dog's head. There were 42 sacred books bearing his name, which were under the guardianship of the Egyptian priests. These books he is said to have composed; and he accordingly appears in the monuments with tablet and stylus. See HERMES TRISMEGISTUS.

Thothmes, thŏth'mēz or tōt'mēz (son of Thoth); the name of 4 Egyptian kings. Under Thothmes I. Egypt saw its darkest days come to an end with the expulsion of the Hyksos, and the revival of truly national art and civilization and of national power. The era of foreign invasion, with the consequent enrichment of the royal treasury, began. Ethiopia was made a tributary state, and eastward the limits of Egyptian power were pushed as far as to the Euphrates. At his death Thothmes I. was succeeded by Thothmes II., his eldest son, with Hatasu, his daughter, and Thothmes III., his younger son, as co-regents. Thothmes II. beautified Thebes, but his reign was brief and insignificant. Thothmes III. was the Alexander of Egyptian history. After the death of Hatasu he entered upon that series of wars which comprised 14 campaigns, in the course of which he subdued Palestine, Syria, Mesopotamia in part, and large tracts of territory between the Euphrates and the Mediterranean. The names of the cities he took, including Megiddo and Tyre, are inscribed in his triumphant self-eulogy on the walls of Karnak. He added extensively to the architectural glories of Thebes. As Hatasu, the Semiramis of Egypt, erased the name of Thothmes II., her half-brother, from his monument at Karnak, so was her name erased with the record of her campaigns, during which she appeared in male attire, from the recording inscriptions, by Thothmes III. He reigned from 1503 to 1449 B.C. He was succeeded by Amenhotep II. at whose death Thothmes IV. began his reign. The latter waged war in Ethiopia, Syria and Phœnicia, but his career was without national or political significance.

Thou, too, **Jacques Auguste de** (in Latin, THUANUS), French magistrate and historian: b. Paris 8 Oct. 1553; d. 7 May 1617. On the revolt of Paris, produced by the violences of the League, he adhered to Henry III., and after the assassination of the Duke of Guise, was principally instrumental in reconciling Henry with the King of Navarre. In 1595 he succeeded his uncle as chief-justice, and immediately registered in anticipation of the Edict of Nantes, which he assisted in preparing, the Edict of St. Germains in favor of the Protestants. In the regency of Mary de Medici he was appointed one of the directors-general of finance, and otherwise employed in nice and difficult matters, in which he was conspicuous by integrity and ability. His greatest literary labor was the composition in Latin of a voluminous 'Historia sui Temporis,' of which the first part appeared in 1604. When finished it consisted of 138 books, comprising events from 1545 to 1607. It is remarkable for its general impartiality. To this he added 'Commentaries,' or memoirs of his own life, composed in the same spirit. The most complete edition of the history is that published in London in 1733, by Buckley, in seven volumes. Consult: Collinson, 'Life of Thuanus, with some Account of his Writings' (1807).

Thought, a word of Anglo-Saxon origin, signifying the act of thinking, and the idea, belief or conclusion which is produced by that act. There are two elements in thought psychologically considered — the act of thinking, as it appears to consciousness, and the lasting effect produced upon the mind, likewise considered from the point of view of consciousness. "Thought," says Caird, "always proceeds from the less to the more determinate, and in doing so it cannot determine any object positively without determining it negatively, or determine it negatively without determining it positively." Thought embraces every cognitive process except sensation. See MAGNETISM; TELEPATHY.

Thought Transference. See TELEPATHY.

Thousand and One Nights, The. See ARABIAN NIGHTS ENTERTAINMENT.

Thousand Islands, a group of islands in the Saint Lawrence River (q.v.), near Lake Ontario. The islands are small, but they are noted for their beauty; there are over 1,500 in all. The belt of Laurentian gneiss which extends from the Adirondacks in New York into Canada, is here crossed by the Saint Lawrence River. The crystalline rock and glacial deposit forming the river bed presents an uneven surface; some of the points being above the water form the many islands. A large number of the islands belong to Canada, the others to the State of New York. Handsome summer residences have been erected on many of the islands, and large hotels furnish accommodations for the many city people who visit the place each summer.

Thrace, thrās, anciently a part of the Balkan peninsula, whose territory was somewhat indefinite, but which comprised the region north of Macedonia, including Scythia. Its territory was understood differently at different times by the ancients, but was later limited to the country between the northern boundary of Macedonia and the Danube, and that which lies between the Black Sea, the Bosporus, the Propontis, and the Hellespont; the Ægean Sea and the Strymon River. The Balkans divided it into two parts — the Romans recognized only the southern division as Thrace. The land was inhabited by wild tribes, abounded in mines, had fertile lands, and produced celebrated horses. The chief mountains were the Hæmus (Balkan), Rhodope and Pangæus. The largest river the Hebrus or Maritza. The chief towns Abdera where Democritus was born; Sestos, and Byzantium. The mythological founders of Greek poetry, music and philosophy are supposed to have come from Thrace.

Thrash'er, one of the large, thrush-like wrens of the American genus *Harporhynchus*, of which the familiar Eastern species is the brown thrasher (*H. rufus*), one of the most pleasing of American migratory birds. It is slender, with a long bill and tail, rufous upper parts and a cream-white breast sharply marked with arrow-shaped streaks. A frequenter of orchard and shade-trees, it is as likely to make its nest on the ground or upon brush-piles near the house as at the edge of the woods, and its

oblong pepper-and-salt sprinkled eggs are familiar to every country boy. The thrasher in spring utters a highly varied song, so brilliant and full of startling phrases of melody and apparent mimicry, that it fairly rivals the performance of the mocking-bird itself. The genus contains several other well-marked and interesting species of the West and Southwest. Consult Coues, 'Birds of the Southwest' (Washington 1879); and ornithologies of the United States generally.

Thrasybulus, thrăs-ĭ-bū'lŭs, Athenian general and democratic leader: d. about 390 B.C. He was a friend of Alcibiades, whose recall from exile he obtained. In 411 B.C. he commanded a galley in the fleet at Samos, joined in the opposition to the oligarchy of the Four Hundred, and exacted an oath from the Athenians in the fleet to uphold democratic government. At the battle of Cynossema he commanded the right wing, and secured the victory by a sudden attack upon the Peloponnesians. In 407 B.C., with a fleet of 30 ships, he reduced most of the revolted cities on the coast of Thrace to submission, and about the same time was with Alcibiades elected one of the new generals. Banished on the establishment of the Thirty Tyrants, he seized, with the aid of some Thebans, the fortress of Phyle, and with an increased force occupied the Piræus. After the accession of the Ten he was defeated by Lysander and Libys, but, together with all who had joined him, was saved from punishment by the contrivance of Pausanias. In 395 B.C. he led an army to the assistance of the Thebans, then menaced by Sparta, and five years later was sent with 40 ships to aid the Rhodians against Teleutias, restored the Athenian interest in Byzantium, secured several new alliances, and reduced Methymna and other towns in Lesbos. Afterward sailing south, he anchored in the Eurymedon, near Aspendus in Pamphylia, when the inhabitants, exasperated by some act of his soldiers, fell upon him in the night and killed him.

Thread. The filaments of fibrous substances spun out for weaving are in a general sense called threads, the specific name of such filaments being yarn. Thread in a specific sense consists of two or more filaments of yarn twisted together for greater strength; when the filaments do not exceed two this is frequently called doubling, and the manufacturers who prepare it are called doublers. Doubled yarn or thread is used in some species of weaving, especially in that called bobbin net, but its principal use is for sewing. When manufactured for this purpose it is specifically known as sewing thread. A large proportion of sewing thread is simply doubled yarn, and the processes of yarn doubling and of the manufacture of sewing thread are substantially the same, but thread for sewing purposes often requires to be stronger and firmer in texture than doubled yarn, and then three, four, and six strands of yarn of fineness proportioned to the thickness of the thread required are used to produce it. The manufacture of sewing thread in the United States is very extensive. The chief seat of the cotton thread manufacture in Scotland is Paisley, in England, Manchester. Linen thread is manufactured largely in Ireland. Cotton was first used in the manufacture of sewing thread at Pawtucket, R. I., by Samuel Salter in 1794. Flax had always been used everywhere, but as Mrs. Salter was spinning cotton, she noticed the fineness of the fibre, and at once conceived that it would make smooth thread. The idea was put into practice.

Thread'needle Street, London, England, the short thoroughfare faced by the Bank of England, which is proverbially called "The Old Lady of Threadneedle Street." The name is supposed to be derived from the three needles on the coat-of-arms of the Needlemakers' Guild.

Thread'worm, one of the thread-shaped nematode intestinal worms annoying to all the higher animals, as *Ascaris,* or *Oxyuris,* which often infests the lower bowel in childhood. See ROUNDWORMS.

Threat is defined in law as a menace of destruction or injury to the lives or property of those against whom it is made, and may be the subject of a civil action for damages or frequently an equitable action may be maintained to restrain threats and intimidations. One who is induced by threats to enter into an agreement, pay money, or do any other act, which in itself is lawful, may by proper means avoid the consequences of such act, same having been performed under duress. One who threatens to do another a bodily harm or to take the life of another may be required to give bond to keep the peace; to threaten a court, or anyone under its immediate protection, is punishable; and in some jurisdictions, to obtain a pecuniary advantage by threat is a punishable offense, as is also a threat to accuse one of a crime for the purpose of obtaining money. In many of the United States the offense of sending threatening letters for the purpose of obtaining money is punishable, and it is contrary to the postal laws of the United States to send upon the outside of any mailable matter any printed or written threatening language, and one is punishable who assists knowingly in forwarding threatening letters.

Three-Color Process, The, and the "trichromatic process," are the names given to an indirect process of color photography which has been successfully developed in various applications, but not in any way with sufficient simplicity of operation to make it commercially practicable except for special purposes. The first suggestion of such a process was made by Prof. James Clerk-Maxwell, in 1861 or before, and the principle was re-invented and elaborated by Louis Ducos Duhauron and Charles Cros in 1869, but the results obtained experimentally were unpromising, and owing probably to this fact and also to the existence of a general prejudice against the idea of color photography by any but a "direct" process, the subject received but little further attention until F. E. Ives, in 1888, stated a new and definite principle of photographic color selection, and gave a successful public demonstration at the Franklin Institute, in Philadelphia. This was followed by a great revival of interest and active experiment, and the commercial development of the process in various applications. The first step in this process is the production of three photographic negatives which constitute a record of the color values in terms of spectrum red, green, and blue-violet lights, these being the only spectrum colors which will by admixture in various proportions reproduce all other colors without material degradation of purity. Such sets of neg-

atives are made by exposing color-sensitive photographic plates in the camera through selective "color screens." Formerly a special red sensitive plate was exposed through a red or orange screen, a green sensitive plate through a green screen, and an ordinary plate through a blue or violet screen. Following Ives, most authorities now recommend the use of only one kind of plate, sensitive to all colors, in order to insure uniformity of gradation and density in the three images with simultaneous development. The equalization of the exposures, also an important element of success, is best accomplished by the use of special cameras, which form the three images simultaneously, from one point of view. Several such cameras designed by Ives make the three images, identical in size and perspective, side by side upon one plate, at one exposure, thus making the negative process as simple as it is in monochrome photography.

From the photographic negatives thus obtained, which record the colors only by differences of density and gradation in the separate images, colored pictures can be made by two synthesis methods, one "positive" and the other "negative." In the method of positive synthesis, red, green and blue-violet lights, in terms of which the three negatives have recorded all the colors of the objects photographed, are used to illuminate three positive "black and white" images made from the negatives, and these three images are then optically blended to form a single image, in which the colors mix to reproduce to the eye the colors, form, and light and shade of the objects photographed. Such optical synthesis is effected either with three magic lanterns or their optical equivalent, or with an instrument called a photochromoscope, which is used like a stereoscope. In the stereoscopic photochromoscope of Ives, the reproduction is so perfect that the objects themselves seem to stand before the eyes. In the method of negative synthesis, positive color prints are made from the three negative images, and superposed in white light, or upon a white surface. It is an interesting fact that the colors used in printing are not the red, green and blue-violet photographing colors, but their complementary colors, a peacock blue, a crimson pink and yellow, commonly but incorrectly called "blue," "red" and yellow. This is because the printing process makes and mixes shadows instead of lights, being complementary to the method of reproducing colors in the photochromoscope.

The negative made through a red screen must print a positive uncolored in its high lights and peacock-blue in its shades. The negative made through a green screen must print a positive uncolored in its high lights and crimson-pink in its shades. The negative made through a blue screen must print a positive uncolored in its high lights and yellow in its shades. It is also important that these colors be perfectly transparent. When these prints are superposed, equal parts of all three colors form blacks and grays, and the pure colors, red, green and blue-violet appear where yellow is superposed on crimson-pink, peacock-blue on yellow, and crimson-pink on peacock-blue. Unlike the method of positive synthesis, no method of negative synthesis fulfils all theoretical requirements in ordinary white light, and if the process is employed to reproduce as difficult a test as the spectrum itself, it must fail to do full justice either to gradation of hues and luminosity values or else to purity of color. The degradation of purity of color resulting when the analysis perfectly differentiates all hue and luminosity values, as in the original method of Ives, is not so considerable as to appear objectionable when perfectly transparent and correct printing colors are employed; on the other hand colors showing diffuse absorption in the spectrum are often pretty correctly reproduced with an analysis in the negative process which, while favoring brilliancy of color in the reproduction, would fail to secure a passable representation of the spectrum. Consequently, authorities, having different opinions as to what qualities are most desirable in a reproduction, must and do disagree as to what is the best principle of color selection for negative synthesis.

This difference of opinion is particularly justifiable in connection with the half-tone trichromatic process, thus far the most important commercial development of three-color photography, because the subjects most often reproduced have colors showing diffuse absorption in the spectrum, and the best reasonably permanent printing inks thus far obtainable are neither correct in hue nor of sufficient purity and transparency to fulfil their theoretical functions.

The first half-tone trichromatic process prints were made by Ives in 1881, but the process was not developed commercially until re-invented and patented by Albert, Duhauron and Kurtz, more than 10 years after. In this process, half-tone blocks are made from the three negatives, and printed in the type press, with the peacock-blue, crimson-pink and yellow inks. In order to prevent the production of an offensive moiré pattern, the lines of the half-tone blocks are disposed at different and suitable angles for the different colors. Owing to the complications of the process, and the theoretical imperfections of materials and means necessarily employed in its commercial operation, the printing plates are more or less re-etched in parts until proofs show the desired result, but with so little work and cost altogether that the process is competing successfully with chromolithography for many purposes, and may eventually supersede it, as half-tone engraving has already superseded wood engraving.

F. E. Ives,
Ives Process Company, New York.

Three Fates, The. See Norns.

Three Hours' Agony, or **Three Hours' Service,** a devotion practised on Good Friday, from noon till 3 o'clock in the Roman Catholic and some Protestant Episcopal churches in commemoration of the Passion. It was introduced by Father Messia, S. J., of Lima, about 1730, and reached Rome in 1738. It was introduced into the English Church about 1865, and was rendered legal by the Act of Uniformity Amendment Act (1872), which permits additional services, consisting of any prayers from the Liturgy or Bible, with address or sermon, and hymns.

Three Kings, the men who came from the East to adore the Infant Jesus (Matt. ii. 1–12). They are probably called kings from Psalm lxxii. 10, which verse is used in the services of Epiphany. They brought offerings of gold, frankincense and myrrh, and according to tradition their names were Gaspar, Melchior, and

Balthasar. On their return to the East they received baptism. The Empress Helena is said to have brought their bones to Constantinople, whence they were removed to Milan, and afterward to Cologne. In the Chapel of the Three Kings, built by the Emperor Maximilian (1459–1519), in Cologne Cathedral, are exhibited their crowns, and the shrine is supposed to contain their relics.

Three-mile Limit. See INTERNATIONAL LAW.

Three Rivers, Canada, city, port of entry, and county-seat of Saint Maurice County, Quebec; on the north bank of the Saint Lawrence River at its junction with the Saint Maurice, 90 miles below Montreal, 66 miles above Quebec; and on the Canadian Pacific, and connected by ferry with the Grand Trunk railway. It has a large export trade in lumber and wood-pulp, the Shawanegan and other falls of the Saint Maurice being extensively utilized as water power for these industries; a large iron works, and important manufactures of foundry products and machinery; and other manufactures. The Roman Catholic cathedral is an imposing structure; other handsome buildings are the bishop's palace, the college, and several convents schools and churches. The city is lighted by gas and electric lights and has hotels, banks, and semi-weekly and weekly newspapers. Three Rivers was founded by Champlain in 1634. Pop. (1901) 9,981.

Thremmatology. A term proposed by Ray Lancaster (from the Greek *thremma,* a nursling) to cover the principles and practices connected with the improvement of domesticated animals and plants. It is distinct from evolution in general in that its ultimate purpose is utilitarian. The breeder is interested in definite results, whereas nature is supposed to be indifferent to everything but the "survival of the fittest." The purpose then in thremmatology is not to make the creature "fit" the conditions of life, but rather to bring both the creature and conditions to harmonize with the highest needs and purposes of man.

This brings to the surface in thremmatology as a question of prime importance, one that is curious rather than otherwise in evolution, namely, Can the conditions of life be employed directly to influence deviation in the desired direction independently of selection; in other words, can individual modification become hereditary, or as the expression goes in general evolution, are acquired characters inherited?

All students agree that the development of individuals is strongly modified by the conditions of life, that is, the environment. Out in nature if these modifications are not inherited it implies only a little more work for selection, and the final result is the same whether they are inherited or not. The answer to the question is interesting therefore rather than vital so long as the study is confined to general evolution; but in thremmatology the answer involves a vital principle because the breeder, especially of animals, cannot afford unlimited selection. All the animals represent money, and the owner is interested in getting results with a minimum destruction of values. He is interested, too, in securing improvements as rapidly as possible, because time is money, and man cannot afford the "countless ages" of nature. If, therefore, individual modifications are inherited, even to the slightest degree, the effect is rapidly cumulative, much time is gained and the necessity for selection is largely reduced,— both important considerations from a business standpoint. Upon the answer to this question will depend the kind of soil and climate employed in plant breeding, the daily care, the shelter, the amount and character of feed provided for breeding animals, as well as the matter of exercise and training where speed or intelligence are involved. That these are important in the development of the individual all are agreed, but is it also necessary that they be provided for breeding stock for the sake of the offspring?

Evolutionists in general are interested primarily in form, while the thremmatologist is concerned very largely, if not mainly, with function. The size or shape of the cow is of less importance than her ability to convert large amounts of feed into milk and do it economically. This faculty depends directly upon the functional ability of a very limited portion of the body and not so much upon the general form. The ability of the horse to attain high speed depends not only upon his conformation but quite as much upon the "quality" of his motor parts, whether active or sluggish, and the mental make-up, whether well balanced or erratic. Functional activity is therefore of much more interest in thremmatology than in general evolution, and functional variation is recognized as one of the principal opportunities for improvement.

The systematic study of thremmatology involves the following topics:

1. A working knowledge of the ordinary theories and concepts of general evolution.

2. The kinds of variation; namely, qualitative, relating merely to size; meristic, relating to pattern; and functional, relating to organic activities.

3. Continuous variation in which all values are presented for selection, and discontinuous variation in which some values seldom or never occur, as in the case of sports, in polymorphism, and as it is involved in the idea of orthogenesis.

4. The causes of variation, first as between different individuals of the same generation; second, as between different individuals of the same parentage but of different generations; third, as between different individuals of the same parentage and the same generation, as with twins, litters, etc., without regard to parentage; fourth, as between succeeding generations of the same species, representing deviation of the race; fifth, modifications in the individual during its development plainly due to the conditions of life, rather than to heredity. These different uses of the term variation should be kept distinctly in mind, and even then it is better to use the word "deviation" for the fourth, and "modification" for the fifth form of what is usually called variation. These causes will drop into two groups; first, selective mating, raising questions touching the basis of selection; second, the environment, raising all questions of the effect of the conditions of life, acclimatization and the inheritance of modifications or acquired characters.

5. Statistical studies of heredity in order to construct the array, eliminate chance, determine

the skew, study the laws of regression and progression, and the relative influence of parents.

6. Correlation, as determined by correlation tables, and useful as indexes of valuable characters.

7. The practical selection of breeders accompanied by a full appreciation of the financial considerations involved, and the relation between performance and breeding powers as exhibited by live stock records.

8. The testing of sires as a final basis of selection.

9. The importance of selecting for prolific strains, among both animals and plants, and the advantages of vigor and longevity.

10. The disturbing effect of fashion, and the best methods of meeting its demands in breeding without sacrificing real quality.

It is important in the study of this phase of evolution that the breeder have in mind fairly comprehensive ideas of general evolution; that he be not a blind adherent of any peculiar dogma, and that he free his mind from a mass of traditions that serve only to cloud the judgment and deter progress. For example, it has been held as a general principle that inbreeding is necessarily fatal to fecundity and to vigor; yet wheat, one of our most vigorous and prolific crops, is systematically inbred. One of the first lessons the breeder should learn therefore is that what is true of one species is not necessarily true of all species.

What has been accomplished by way of improvement, and it is much, has been gained almost exclusively by selection, and under disadvantageous circumstances. For example, among plants increase is so rapid as to compel sweeping selections merely for reduction of numbers, not affording opportunity for as good a basis of judgment as if more space and time were at hand. In this way some of the best things are lost. On the other hand among animals numbers are too few for the best selection and the oft-repeated attempt "to establish a small herd of high-class animals" has been as often a failure for the reason that numbers are too few to afford material for proper selection even to maintain the initial standard, to say nothing of improvement.

The well-nigh universal practice of using young sires is fatal to the most rapid progress, for in such cases the selection has been made before full development. Thus some of the worst specimens are accepted because prepossessing at an early age, and many of the best are discarded, which, if given time to fully mature would prove their right to exist.

The practice among the better breeders today is tending toward larger numbers, better conditions of life, the selection of more mature animals, followed by an actual breeding test resulting in older sires, emphasis of those "points" that have their basis in utility, and withal an ideal standard that, once adopted, is changed but slowly, if at all.

As would be expected the most rapid progress has been made in those breeds or varieties of animals and plants in which practically all the individuals can be put to the performance test. For example, it is comparatively easy to get a record from a cow or a speed horse and to know what the one can do at the pail or the other on the track. On the other hand it is impossible to put the meat animal to the actual test without sacrificing the individual as a breeder. Accordingly breeders of beef cattle, swine, and other meat-producing animals, have been working somewhat in the dark, and to relieve the situation many have felt obliged to sacrifice on the block some of their best bred animals in order to test their standards of selection and verify their methods of breeding.

The improvement of animals and plants is a difficult and often a money-losing enterprise, but it is fascinating because of what is possible. By breeding, the sugar content of beets has been increased from 3 or 4 per cent to 12 and even 20 or more per cent. Corn has been bred richer in nitrogen than is wheat, and its oil content is raised or lowered at will. So far as is known any character may be substantially improved and the upper limit of improvement has never yet been reached with any animal or plant.

Many plants, and some animals, have received little attention at the hands of the breeder, and have either become extinct, or else exist among us with little or no improvement, except such as has naturally followed upon better general conditions. Conspicuous examples are clover and alfalfa, among legumes; timothy and other non-grain producing grasses; asparagus, salsify, and many other vegetables, and most shade and ornamental trees.

Cats breed without attention and their variations do not therefore become fixed. The American bison was allowed to become extinct, not because he would not have become useful if carefully bred, but because he was too near like common cattle to repay the trouble of domestication. In the same way the common hen prevented the domestication of the prairie chicken, but fortunately no real rival stood in the way of that truly American bird, the turkey.

Thus has thremmatology lost much valuable material, but notwithstanding this, there is yet at hand awaiting the attention of the master much that is full of undeveloped possibilities, and with the development of our knowledge of the principles underlying heredity and variation great improvements in methods of breeding may be confidently expected.

EUGENE DAVENPORT,
Dean of the College of Agriculture, University of Illinois.

Thresher Shark, or Fox Shark, a well-known shark (*Alopias vulpes*), with a short conical snout, and less formidable jaws than the white shark. The upper lobe of the tail fin is very elongated, being nearly equal in length to the rest of the body, and is used as a weapon by which this shark is able to kill or disable many fishes in a school, when he rushes into the midst of the crowd and lays about him. Tail included, the thresher attains a length of 13 feet. It inhabits the Atlantic and the Mediterranean.

Threshing Machines. See AGRICULTURAL MACHINERY AND IMPLEMENTS.

Thrift, a stemless fleshy herb (*Statice armeria*) of the seacoasts and cold or mountainous regions of the world. It has tufted rosettes of linear leaves with no perceptible difference between blade and petiole, and white, pink, or purple 5-merous flowers, with clawed petals. These blossoms are nearly or quite sessile in compact heads terminating an almost naked

scape, and are subtended by brown, dry bracts, the two lowest reflexed, and partly united into a sheath. Thrift is otherwise known as sea-pink or lady's cushion, and is occasionally cultivated for flower-borders.

Thring, Edward, English schoolmaster and author: b. Alford, Somersetshire, 29 Nov. 1821; d. 22 Oct. 1887. He was educated at Eton and King's College, Cambridge, and after taking holy orders and serving as curate at Gloucester and elsewhere, in 1853, was appointed head master of Uppingham school. From an institution run down in efficiency and reputation he made it one of the healthiest, best equipped, and flourishing public schools of England. No schoolmaster since Arnold was more successful in imprinting on the characters of his pupils a high ideal of duty as the great end of life. His own earnestness and honesty, his firm discipline, and stern denunciation of cowardice and wrong gave character and reputation to the school. Among his published works are 'Thoughts on Life Science' (1869); 'The Theory and Practice of Teaching' (1883); 'Uppingham Sermons' (1886); 'Poems and Translations' (1887); and 'Uppingham and School Songs and Borth Lyrics' (1887). Consult: Parkin, 'A Memory of Edward Thring' (1898); Skrine, 'Uppingham by the Sea' (1878).

Thrips, a genus of minute insects, order *Hemiptera,* suborder *Homoptera,* closely allied to the *Aphides.* They are extremely agile and seem to leap rather than fly, whence the common name "leaf-hopper." They live on flowers, plants, and under the bark of trees. *T. cerealium* is a common species, scarcely a line in length or in extent of wing, residing in the spathes and husks of cereals, especially wheat, to which it is most injurious.

Throat, the front of the neck, including the structures below the chin and above the collarbone, and also, by an extended usage, the passage from the mouth to the stomach (fauces, pharynx, and œsophagus), and the passage from the mouth to the lungs (larynx and trachea or windpipe), these being the passages for food and breath. The throat and its various structures are subject to many diseases, some of which are among the most difficult with which medicine has to deal. See Nose and Throat.

Thrombo'sis, the formation or development of a thrombus in the heart, blood-vessels, lymphatics, or other ducts. It is essentially the coagulation of fibrinogen, and is usually induced by some condition which retards the flow of the blood, lymph, etc., such as roughness or other structural change in the lining membrane of a vessel, or the presence of some foreign body, or some alteration in the constitution of the blood, lymph, etc. In the heart and arteries it seldom occurs unless their lining membranes are roughened or their muscular tone is so much impaired that the blood is not forcibly and readily propelled onward. It is most frequent in veins, where the circulation is naturally slow, and it rarely occurs in capillaries. The thrombi formed may shrink and dry into leather-like masses, or calcify, forming phleboliths (in veins), or soften and be absorbed or suppurate; or they may organize, as after the ligaturing of an artery. Some of the causes of thrombosis are: wounds and other injuries, inflammation (see Phlebitis; Phlegmasia), pressure on a vessel, failure of the propelling power of the heart, as in cases of marasmus and exhausting diseases, and bacterial infection of the blood. The symptoms of thrombosis are those of the arrest of the circulation and differ according to the vessel affected. They include passive hyperæmia, venous dilatation, swelling of adjacent parts, gangrene, anasarca of an extremity, etc. The treatment varies according to the seat of the affection.

Thrombus, a plug or clot formed in a vessel and partially or totally closing it. If it remains at its place of origin it is called a primary thrombus; if it has grown beyond its original limits it is a propagated thrombus; carried by the blood-current from a distant blood-vessel and forced into a smaller one, obstructing the circulation, it becomes an embolus. A thrombus consists of coagulated fibrin entangling in its meshes red and white blood-corpuscles, or of coagulated lymph, in lymphatics, and of late the term has been applied (milk thrombus), to an accumulation of curdled milk in a lactiferous tube. Thrombi are designated by various names according to their color, causation, shape, etc. Thus a white thrombus is one which contains no pigment, or is composed chiefly of leucocytes; red, one of dark red color; traumatic, one which results from an injury; infective, one occurring as the result of septic or bacterial poisoning; annular, one which has an opening through its centre, the circumference being attached to the wall of the vessel; and laminated or mixed, one whose substance is disposed in layers, which may differ in material. Thrombi, if small and remaining at the point of origin, may do little or no harm, but they are liable to be swept away and to become dangerous emboli. If they block up the lumen of a vessel they give rise to pain and swelling and to loss of function in parts of the body more or less remote.

Throne, a chair of state or seat occupied by a sovereign, bishop or other dignitary. The modern throne is usually a decorated arm-chair of great size, raised on a dais and covered with a canopy, more or less ornamented. Anciently the throne was very elaborate; was made of marble, decorated with precious stones, and was frequently supported by pillars or figures representing beasts or men.

Throop (troop) **Polytechnic Institute,** located at Pasadena, Cal. It was founded in 1891 by Amos G. Throop to provide a liberal and practical education for both sexes. It is entirely non-sectarian, the charter providing that a majority of the trustees "shall not belong to any one religious denomination." Its organization comprises five schools: (1) the Grammar School; (2) the Academy; (3) the Commercial School; (4) the Normal School; (5) the College. The academy offers three courses, classical, literary and scientific; and the college three courses, chemistry, electrical engineering, and natural science, all leading to the degree of B.S. Some studies in each course are required, and some elective. Throughout the grammar and high school grades, manual training is a regular part of the curriculum; instruction is given in wood carving, sloyd, carpentering,

forging, machine-shop work, clay modeling, mechanical and free-hand drawing, sewing and domestic science. The Commercial School provides a two years' course; and the Normal School three two years' courses in manual training, domestic economy, and free-hand drawing and designing, all of which include psychology, pedagogy, and history of education. There is also a summer school of art and manual training, designed mainly for teachers; work done in this school is credited toward a normal diploma. The Institute (1904) occupies two buildings, Polytechnic Hall and East Hall. The library in 1904 contained 2,000 volumes; and the Pasadena Public Library is also open to students. The students in 1903–4 numbered 435 in all departments, of whom 235 were in the Academy, and 115 in the Grammar School.

Throstle, a Scotch name, like "mavis", for the British song-thrush (q.v.).

Thrush, a bird of the passerine family *Turdidæ,* a family which contains some of the most familiar and attractive birds, and most of the best songsters of the world. The family is very large, is scattered over the whole globe and is characteristically but not entirely migratory. These birds vary in size from among the smallest, to the bigness of the American robin (q.v.), which is a typical form; and most of them are elegant in form and pleasingly but not gaudily colored. The thrushes are divisible into five subfamilies. The thrushes proper (*Turdinæ*) are represented by such familiar forms as the American bluebird, robin, wood-thrush, shy northern hermit, and olive-backed thrushes, noted for their richly melodious songs, the English blackbird, song-thrush, mistle-thrush and fieldfare, besides the nightingale, robin-redbreast, hedge-sparrow, and many related forms in other parts of the world, most of which are elsewhere described under their names. Three American thrushes of this group call for brief mention, namely the hermit thrush (*Hylocichla pallasii*), which is migrant through the Eastern States, breeding in the far north, and is noted for its grand song, which has been said to express "serene religious beatitude"; the olive-back or Swainson's thrush (*Hylocichla ustulata*), distinguished by the olive tint of its upper parts, and also a sweet-voiced migrant; and the tawny thrush (see VEERY). In all of these the young are spotted, although the adults may be uniformly colored.

The second subfamily is composed of the genera *Myiodectes* and *Cichlopsis.* The third contains the Old World warblers (*Sylviinæ*), fantails, kinglets (qq.v.), and the like; the fourth (*Polioptilinæ*) the gnat-catchers (q.v.); and the fifth (*Mimimæ*), the mocking-birds, thrashers (qq.v.), and related forms, many of which seem to imitate other birds, composing their own songs out of a medley of other notes, although the report of this tendency has usually been exaggerated; this last subfamily is by the most modern ornithologists separated from the thrushes and put with the wrens. Consult Evans, 'Birds' (New York 1901).

Thrush, in medicine, white-mouth, or sprue, a form of parasitic stomatitis, due to the presence in the mouth of the thrush-fungus. (See MOUTH.) The disease usually occurs in infants, but may appear later in life, even in old age, in association with some severe acute illness or some wasting disease, as pulmonary tuberculosis. The patches of thrush are most commonly found on the dorsum and edges of the tongue, on the hard palate, and on the inside of the lips and cheeks, and resemble curdled milk. Although the fungus may enter and even be formed in a healthy mouth, it will not flourish there. Inflammation or other abnormal condition of the mucous surface, and acid secretions, cause it to grow and develop. Thrush may be propagated by contagion, and in some institutions is at times almost endemic. It may be conveyed from one babe to another through an infected nipple of a nurse, or by means of infected spoons, feeding-bottles, teats, etc. Usually the mucous membrane of the mouth underlying the fungous patches is of a bright or livid red, but when the system of the patient is much deteriorated, and the mycelium has penetrated deeply, shallow ulcerations may result. Sometimes the fungus of thrush is found in diphtheritic membranes. Any doubt as to the nature of white patches in the mouth should be settled by a microscopic examination.

Of itself thrush is not dangerous, but it is usually significant of a deteriorated state of health. Occurring in apparently healthy children, it lasts but a few days; in children having gastro-intestinal catarrh and diarrhœa, and who are much debilitated, it may last for weeks, fresh spots appearing as others vanish. The redness and excoriation around the anus and adjacent skin of infants so affected is vulgarly regarded as an indication that the "thrush has run through the patient," and if the mouth condition has improved it is considered a favorable sign. While the thrush-fungus has been found in the œsophagus, and even lower in the alimentary canal, there is no reason to believe that it is the cause of the redness and excoriation above referred to, which are rather due to a superficial dermatitis resulting from an excess of starchy food and a vitiated blood state.

Strict attention to diet is necessary in treatment: diminish the amount of sugar and starchy food, and give milk and lime-water. The mouth must be kept clean, and the chance of acidity diminished by dilute alkaline fluids, such as lime-water or Vichy. A solution of borax and glycerin, or of sulphite of sodium, should be frequently sprayed upon the patches or applied with the finger, covered with soft cloth. The general health is to be maintained by tonics, hygienic measures, and relief of debilitating ailments.

Thrush, in veterinary surgery, a diseased condition of the frog of the horse's foot appearing as a severe and acute inflammation, which usually proceeds to ulceration, and which is accompanied by a fetid discharge. It is most frequently seen in horses of unsound constitution, and especially appears in stables where drainage and cleanliness are deficient. The best application for it is mineral tar. Calomel dressing is to be substituted for the tar in severe and intractable cases, and ulcerated and loose parts of the frog are to be carefully removed.

Thrus'ton, Gates Phillips, American soldier: b. Dayton, Ohio, 11 June 1835. He was graduated from Miami University in 1855, and from the Cincinnati Law School in 1859. He served in the Union army during the Civil War

and was brevetted for gallantry at Stone River and Chickamauga. He became judge-advocate of the Army of the Cumberland, and has published, 'Antiquities of Tennessee and Adjacent States' (1890).

Thruston, Lucy Meacham, American novelist: b. King and Queen County, Va., 29 March 1862. She was graduated from the State Normal School and was married to Julius Thruston in 1887. She has published: 'Mistress Brent' (1901); 'A Girl of Virginia' (1902); 'Jack and His Island' (1902).

Thucydides, thū-sĭd'ĭ-dēz, Greek historian: b. Attica about 460 B.C.; d. about 400. His father's name was Olorus, his mother's Hegesipyle. He possessed gold mines in Thrace opposite the island of Thasos, and was in consequence one of the richest and most influential men in Thrace. In 431 B.C. the Peloponnesian war, which forms the subject of his work, was begun. In 430 the plague broke out in Athens. Thucydides took it, but recovered, and in 424 B.C. commanded a squadron of seven ships at Thasos. The Spartan general Brasidas besieged Amphipolis, and Eucles, who commanded in that important post, sent to Thucydides for aid. Thucydides made all haste in preparing to answer the summons, and seems to have used his private means to forward his equipment, but Brasidas, apprehensive of the approaching relief, offered favorable terms to Eucles, which were accepted, and Thucydides only arrived the day after the surrender. Yet he was in time to save Eion from falling into the hands of the enemies. Whether this transaction led to the banishment of Thucydides, or whether he exiled himself to escape death as its probable consequence, is not known; but from this time he became an exile, and the duration of his exile, according to his own account, was 20 years. Before the conclusion of this term the war terminated (404 B.C.), and all political exiles were permitted to return. Thucydides returned to Athens in the following year; and met a violent death a year or two later, but at what exact time, and whether in Thrace or Athens, is not known. During his exile he remained close to the theatre of the war, of which he was a diligent observer, and as he could not remain in the Athenian dominion he may have passed this period of his life, or the greater part of it, within the domains of the Spartan alliance. It is also probable that he visited Sicily and southern Italy. His history consists of eight books, the last of which differs from the others in containing none of the political speeches which form so striking a feature of the rest, and is also generally supposed to be inferior to them in style. Hence it has been thought by various critics to be the work of a different author, of Xenophon, of Theopompus, or of a daughter of Thucydides; but it is more probable that it is the author's own without his final revision. The history is incomplete, the 8th book stopping abruptly in the middle of the 21st year of the war. As a historian Thucydides holds the foremost place. He was painstaking and indefatigable in collecting and sifting facts, brief and terse in narrating them. His style is full of dignity and replete with condensed meaning. It is, however, sometimes harsh and obscure from over-condensation. He 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, and has been styled the "Statesman's Handbook." It is to the superiority and impartiality of his judgment that he owed the power of producing a work which should be, as he himself said, a possession for posterity. Among the most valuable editions of Thucydides are those of Bekker (1821); Poppo (1821–38); Stahl (1873–4); and Classen (1897). There are English translations by the Rev. Thomas Dale and Prof. Jowett.

Thugs, or **Thags,** a sect of assassins which committed many crimes in India until the British government undertook to crush it out by vigorous and severe punishment. The Thugs were robbers as well as assassins, and while they professed to regard the murders they perpetrated as religious acts, they commonly chose for their victims persons who had valuable property in their possession. Another fact throwing a doubt on the sincerity of their religious professions was that the majority of Thugs belonged, or had belonged, to the Mohammedan creed, whereas they claimed that they committed their deeds of blood to propitiate the Hindu goddess, Kali. The sect flourished in northern India, where many travelers were cut off by them, being usually strangled while asleep. The British authorities began systematic efforts to exterminate the Thugs about 75 years ago. Hundreds were executed, and hundreds of others sentenced to hard labor for life. It is a crime punishable with life imprisonment to belong to a gang of Thugs. Nevertheless it is understood that the Thugs have not been extirpated, and the surviving gangs have recently shown signs of being active.

Thule, thū'lē, a name given by the ancients to an island or group of islands in the ocean to the northwest of Europe. It was thought to be the northernmost inhabited region of the earth. It is believed to have been the Shetland Islands, though some have identified it with Iceland.

Thulite, a rose-pink variety of the mineral zoisite (q.v.).

Thul'strup, Thure de, American artist: b. Sweden 1848. He entered the Swedish army in 1865; served in the Franco-Prussian war and was present at both battles of Lyons. Emigrating to the United States in 1872 he joined the staff of the 'Graphic' as illustrator; was connected with the Frank Leslie publishing house in the same capacity from 1876 to 1880; when he entered the service of Harper Bros. He is especially well known as a military and historical illustrator.

Thumann, too'mān, **Paul,** German painter: b. Tschacksdorf 5 Oct. 1834. He was a student in the Academy of Berlin from 1853 to 1855 and subsequently worked under Julius Hübner in Dresden till the year 1860. At Weimar he studied with Ferdinand Pauwels and in 1866 was appointed professor in the Art School of that city. From 1875 to 1887 he filled the duties of professor in the Art Academy of Berlin. He has been mainly occupied in the illustration of Auerbach's 'Kalender'; Goethe's 'Wahrheit und Dichtung'; Tennyson's 'Enoch Arden'; Chamisso's works; and Heine's 'Buch der Lieder,' etc. His success in this work is due to the powerful drawing, thoughtfulness, and gen-

uine feeling which characterize his style; yet latterly he has lapsed into a certain sickly sentimentality and frivolity of treatment which have injured the reputation won by his early productions. Among his paintings the best are five canvases which illustrate the life of Luther, executed for the castle of Wartburg; 'The Wedding of Luther'; 'The Return of Hermann from the Battle of Teutoburg Forest'; and 'The Three Fates.'

Thun, toon, Switzerland, a lake in the canton of Bern, 10 miles long by two miles broad, and very deep (1,844 feet). It forms the outlet of the Aar, which leaves it at the northwest. The lake is enclosed by gentle slopes, covered with villas and orchards, except beyond Sigriswyl, where the north bank is more precipitous. The scenery is idyllic. Fish are plentiful, especially eels, carp, pike, etc. Steamers run from Thun to Interlaken, and an old road follows the coast toward the south, a new one toward the north. The important towns along the banks are: Oberhofen (health resort); Spiez, and Simmerthal. The town of Thun is one mile distant, and is the station for travelers touring the Bernese Oberland.

Thunder. See LIGHTNING.

Thunder-bird, an imaginary bird occurring in the mythology of races of low culture, and personifying thunder or its cause. Among the Caribs, Brazilians, Algonkins and various other North American Indians and among the Karens of Siam, the South African Bechuanas and Basutos, and other aborigines, there are legends of a flapping or flashing thunder-bird, which seem to translate into myth the thought of thunder and lightning descending from the upper regions of the air, the home of the eagle and the vulture.

Thundering Legion, a name given to a Roman legion in the time of the Emperor Aurelius. After the expulsion of the Marcomanni and Quadi from Hungary, the Emperor Marcus Aurelius, pursuing these German tribes with a detachment of his forces (174 A.D.), was shut up in a valley surrounded on every side by high mountains. To those who were thus cut off from the main body of the army the heat and the want of water were no less dangerous than the attacks of the enemy. In this crisis a sudden shower of rain re-animated the Roman soldiers. At the same time a storm of hail, attended with thunder, assailed the enemy, who were now easily repulsed and conquered. According to Dio Cassius the miracle was wrought by an Egyptian sorcerer in the train of the emperor; according to Capitolinus it was the effect of the emperor's prayers; but according to Tertullian and Eusebius it was brought about by the prayers of the Christians in his army.

Thurgau, toor'gow, Switzerland, a canton at the northeast, with an area of almost 388 square miles. Unlike most Swiss cantons it has no high elevations, but a diversified surface, most of which is productive. It belongs to the Rhine basin and is chiefly watered by the Thur and affluents. There are extensive forests, and the arable lands yield a limited amount of grain and potatoes, and grapes — fruit is abundant. Manufactures consist of linen and hempen cloth, ribbons, lace, hosiery, muslin, buttons, and wooden articles. There is considerable trade, owing partly to Lake Constance and the Rhine on its borders. The canton was organized in 1798, although it had been in possession of the Swiss from 1460. Prior to that time it belonged to the House of Hapsburg. Pop. (1900) 113,110.

Thu'rible, a censer, a vessel for burning incense. Thuribles of some kind must be as old as use of incense in church services. The modern thurible consists of a metallic vessel or cup, sometimes of gold or silver, but more commonly of brass or lateen, in which burning charcoal is placed, with a movable perforated cover. Chains are attached, so that the thurible may be waved to and fro for the readier dispersion of the smoke of the incense, which is thrown on the live charcoal.

Thu'rifer, in Roman Catholic Church services, the attendant at high mass, solemn vespers, and benediction, who uses the thurible, either by simply waving it to and fro or for incensing the clergy, choir, and congregation, and at certain times presents it to the officiating priest that he may incense the altar or the Host. Strictly speaking, the office of thurifer belongs to the acolyte, the highest of the four Minor Orders, but all the functions of the acolyte are now freely performed by laymen.

Thüringerwald, tü'rĭng-ĕr-vält, or **Forest of Thuringia**, Germany, a series of mountain ranges centrally located, extending from the Werra near Eisenach southward as far as the Valley of the Rodach. The ramifications toward the southeast and the west, connect it with the Frankenwald and the Rhön Mountains. The highest elevations are found in the Grosser Beerberg (3,228 feet), and the Schneekopf (3,201 feet), west of Zelle. The entire mountain range is covered to its summit with evergreens and leafy trees, and its slopes and valleys present charming landscape and views. The principal streams are the Gera, Wipper, Ilm, Schwarza and Loquitz, flowing into the Unstrut and Saale; the Rodach, Haslach, Steinach and Itz; and the Werra with its affluents — the Hörsel and Leina. There are rich deposits of iron, copper, cobalt, lead, and in the neighborhood of Friedrichsroda, alabaster. The valleys and slopes are the scene of an active industry, including porcelain factories, glass-works, wooden manufactures, especially toys, slate, meerschaum and other pipes, fire-arms, and celebrated pottery. Thüringerwald is much frequented by tourists, and the transportation and other facilities are unsurpassed.

Thuringia, thū-rĭn'jĭ-a (German, THÜRINGEN, tü'rĭng-ĕn), Germany, a district lying between the Thüringerwald and the Harz Mountains; the Werra and Saale rivers. It comprises portions of Prussia, Saxony, and Bavaria besides the Thuringian states. It was once a much more extensive territory. The name was derived from the Thuringian tribe which occupied it in the 5th century. Much of its area is covered by the Thüringerwald (q.v.).

Thurlow, thĕr'lō, **Edward**, LORD, English lord-chancellor; b. Bracon Ash, Norfolk, 9 Dec. 1731; d. Brighton, Sussex, 12 Sept. 1806. He was educated at Caius College, Cambridge, subsequently entered the Middle Temple, and in 1754 was called to the bar. In 1761 he attained the rank of king's counsel, and was employed to prepare the evidence for the appeal in the great

Douglas cause. In 1765 he was returned as member of Parliament for Tamworth, and became a constant supporter of Lord North's administration. In 1770 he was made solicitor-general, and attorney-general in 1771. In 1778 he was appointed lord-chancellor, and raised to the peerage as Baron Thurlow. The personal favor of the king retained him in office during the Rockingham administration, whose measures he actively opposed, but was compelled to resign on the dissolution of the ministry in 1783. He was still considered the confidential adviser of the king, and on the dissolution of the coalition ministry at the close of the year, the great seal was restored to him by Pitt. In 1788 the king's illness rendered it necessary to consider the contingency of a regency and Pitt suspected Thurlow of intriguing with the Prince of Wales. Thurlow then began publicly to oppose the measures of his colleagues, particularly Pitt's scheme for maintaining the sinking-fund, in the House of Lords, whereupon Pitt demanded his dismissal, to which the king at once agreed.

Thurman, thêr'man, **Allen Granbery,** American lawyer and politician: b. Lynchburg, Va., 13 Nov. 1813; d. Columbus, Ohio, 12 Dec. 1895. He was brought, in childhood, to Chillicothe, Ohio, and there received an academic education. After teaching for a time he studied law in the office of his uncle, William Allen (q.v.); in 1835 was admitted to the bar and forming a partnership with his uncle, soon attained success as a practising lawyer. At the same time that he began his legal career he became active in politics as a member of the Democratic party, but held no political office until 1844 when he was elected to Congress. He was one of the earnest supporters of the administration in the conduct of the Mexican War; though a Democrat and opposed to any change in the Missouri Compromise (q.v.), he, with the most of the northern Democrats, voted for the Wilmot Proviso (q.v.), and replied to southern criticism of this act in a speech stating, forcibly, the reasons of the North for opposing the extension of slave territory. At the close of his Congressional term he resumed the practice of law, and in 1851 was elected one of the judges of the Ohio supreme court; here his learned and able decisions won him wide reputation as a jurist. When his term of office expired in 1856 he again took up the practice of his profession, this time in Columbus. He took no active part in politics until 1867, when he was nominated by the Democrats as governor of Ohio; he conducted a vigorous campaign, and though defeated by a small plurality, the Democratic party carried the legislature. In the next year he was elected to the United States Senate and re-elected in 1874. His ability in debate won him immediate recognition, and he was appointed a member of the judiciary committee, and became the leader of his party in the Senate; during his last term he was elected president *pro tem.* He favored a liberal policy of reconstruction, introduced the so-called Thurman Bill compelling the Pacific Railroad to comply with the conditions of their franchise, and succeeded in effecting the passage of this bill against a powerful opposition. In 1876 he was a member of the Electoral Commission (q.v.), and steadfastly supported the claims of Tilden. He was a candidate for the Democratic presidential nomination in 1876, 1880 and 1884; in 1881 he was appointed a member of the Paris Monetary Conference. In 1888 he was the Democratic nominee for vice-president and took active part in the campaign; after the defeat of his party in that year, he retired from political life.

Thursby, thêrs'bĭ, **Emma,** American concert singer: b. Brooklyn, N. Y., 17 Nov. 1857. She studied in Milan under Lamperti and Madame Rudersdorff; in 1875 made a concert tour of Canada and the United States and in 1878–9 made a similar tour in England and France. In 1880–1 she was prima donna in Maurice Strakosch's company, and in 1903 gave concerts in Japan and India.

Thursday, the fifth day of the week, so called from the old Teutonic god of thunder, Thor, the northern Jupiter. The German name Donnerstag is of similar origin; and Thor, Donner, are equivalent to English thunder. Ascension-day is often called Holy Thursday.

Thursday Island, Queensland, a small island in Torres Strait, 30 miles from Cape York. It has an excellent harbor, Port Kennedy, which is a port of call and trade depot. Pop. (1900) 1,431.

Thurston, thêrs'tŏn, **John Mellen,** American lawyer and politician: b. Montpelier, Vt., 21 Aug. 1847. He was educated at Wayland University, and in 1869 was admitted to the bar. From 1888 to 1896 he was chairman of the Republican national conventions, and was United States senator from Nebraska in 1895–1901. In 1901 he was appointed United States commissioner to the Saint Louis Exposition.

Thurston, Robert Henry, American engineer and educator: b. Providence, R. I., 25 Oct. 1839; d. Ithaca, N. Y., 25 Oct. 1903. He was graduated from Brown University in 1859, and received his mechanical training in his father's engine-building shops. In 1861 he joined the engineer corps of the navy, served during the Civil War, was twice promoted, and in 1865 was appointed assistant professor of natural philosophy at the United States Naval Academy. In 1872 he resigned his commission in the navy, and accepted the professorship of mechanical engineering at the Stevens Institute of Technology. He was appointed a member of the United States scientific commission to the Vienna Exhibition in 1873; and in 1885 became the director of Sibley College, the engineering department of Cornell University, and university professor of mechanical engineering. The excellence of the Sibley College curriculum is largely due to his ability as an organizer, and his administration made the college one of the foremost engineering schools of the country. As an inventor he was known for his magnesium burning lamps, army and navy signal apparatus, various forms of testing machines for iron and other metals, and an engine-governor and other improvements on the steam-engine. In scientific research his most noteworthy work was done in investigating the commercial economy of the steam-engine, and in determining the useful qualities of various alloys. His contributions to engineering and scientific literature are also of value, being marked by a clearness of statement unusual in technical writing. The more important of his publications are 'Materials of Engineering' (1884); 'Manual of the Steam Engine'

(1890–1901); 'Manual of Steam Boilers' (1888); 'Engine and Boiler Trials' (1889); 'History of the Steam Engine' (1878–1901). Others are 'Friction and Lubrication' (1884); 'Materials of Construction' (1884); 'Stationary Steam Engines' (1885); 'Friction and Lost Work in Machinery and Mill Work' (1885); 'Heat as a Form of Energy' (1890); 'Life of Robert Fulton' (1891); and numerous scientific papers.

Thusnel'da, wife of Arminius (q.v.), chief of the Cherusci, a German tribe which drove the Romans from the Elbe and the Weser in 9 A.D. In 14 A.D. the Roman legions again penetrated the German interior, and Thusnelda was taken captive to Rome by the Roman conqueror, Germanicus.

Thwaites, thwāts, Reuben Gold, American historian and editor: b. Dorchester, Mass., 15 May 1853. He was educated at the high school of his native town and in 1874–5 took a post-graduate course at Yale. From 1876 to 1886 he was managing editor of the Wisconsin 'State Journal.' He has published 'Down Historic Waterways' (1888); 'The Story of Wisconsin' (1890); 'The Colonies, 1492–1750' (1891); 'Afloat on the Ohio' (1897); 'Father Marquette' (1902); etc. He has also edited 'The Jesuit Relations,' in 73 volumes (1896–1901); 'Original Journals of Lewis and Clark' (1903); 'Early Western Travel, 1750–1850,' in 35 volumes (1903); and other works.

Thwing, twĭng, Charles Franklin, American college president: b. New Sharon, Maine, 9 Nov. 1853. He was graduated at Harvard in 1876, and at Andover Theological Seminary in 1879; was pastor of the North Avenue Congregational Church, Cambridge, Mass., 1879–86, and of Plymouth Church, Minneapolis, 1886–90. Since 1890 he has been president of the Western Reserve University, Cleveland, Ohio. He has been a frequent contributor to periodicals, and has published 'American Colleges: Their Students and Work'; 'The Reading of Books'; 'Within College Walls'; 'God and His World'; 'If I were a College Student' (1902); etc.

Thyestes, thī-ĕs'tēz. See ATREUS.

Thyl'acine, an Anglicization of the generic term *Thylacinus* given to the predatory marsupial called Tasmanian or zebra wolf, and described under DASYURE (q.v.).

Thyme, one of the species of the labiate genus *Thymus*, small, shrubby, perennial herbs of the Old World, cultivated on account of their aromatic foliage as flavoring herbs, or for ornament. *T. vulgaris*, an erect, or somewhat decumbent plant, from 1 to 2 feet high, has sessile linear-lanceolate leaves with revolute margins. The pale-lilac flowers are small, and in interrupted spikes at the ends of the branches. Thyme has a very strong and pungent odor, and was formerly employed for seasoning. It is a favorite food of bees, and that of the Grecian hills produced the famous honey of Mount Hymettus. Another thyme, sometimes grown as a culinary herb, but more often to cover rockwork and waste places, is the creeping thyme or mother-of-thyme (*T. serpylliformis*). Its internodes are short, so that the plant is very leafy, and it grows in dense, broad tufts. One of its varieties (*citriodorus*), is the lemon-scented thyme. Oil of thyme is distilled from these plants, especially in France, where they are very abundant, and may be used in perfumery instead of the oil of origanum, and is of utility in veterinary practice. Thymol is a solid, acrid, stearoptene obtained from this oil, and is used, chiefly externally in alcoholic solution, for a stimulant and powerful antiseptic in the treatment of wounds and sores. Other labiates called thyme, from their aroma, are *Calamintha acinos*, and *C. nepeta*, the basil thyme, and *C. clinopodium*, the horse-thyme. The cat-thyme is the herb-mastic, or *Teucrium marum*, a powerful sternutatory, useful for its scent. Virginian thyme is *Pycnanthemum lanceolatum*; water-thyme, *Elodea* (*Anacharis*) *alsinastrum*.

Thyme Oil, a volatile oil obtained by distilling the leaves and flowering tops of *Thymus vulgaris*, or garden thyme, with water. Colorless when pure, sparingly soluble in water, easily so in alcohol. It contains two hydrocarbons pinene, $C_{10}H_{16}$, and cymene, $C_{10}H_{14}$, as well as a phenol-like body thymol. Used in liniments and dressings as a stimulant and antiseptic.

Thymol, in chemistry, $C_{10}H_{13}.OH$, a colorless crystalline substance obtained from the oil of thyme. Often called thyme camphor. Its chemical nature is analogous to that of phenol, or carbolic acid, though it has but little of the caustic properties of that body. It crystallizes in plates, is almost insoluble in water, soluble in alcohol, melts at 44° C., and is very easily attacked by many chemical agents. It has a thyme-like odor and is used as an antiseptic and disinfectant. Iodine and caustic potash convert it into di-iodo-thymol, which is the well-known antiseptic aristol.

Thy'mus Gland, one of the ductless glands, existing as a temporary organ, developed to its full size about the end of the second year of life and decreasing in size after that period. At puberty it almost or wholly disappears. At its full development it appears to consist of two lobes or halves, situated in the middle line, and placed partly in the neck, extending from the cartilage of the fourth rib upward as high as the inferior edge or border of the thyroid gland (q.v.). It is covered in front by the breast-bone, and by the sternohyoid and sternothyroid muscles. It rests upon the pericardium or heart-sac, and lies on the neck on the front and sides of the trachea or windpipe. This gland is of a pink-gray color, exhibits a lobulated appearance, and is of soft consistence. Its weight at birth is one half an ounce. Its microscopic structure exhibits a composition of lobules, each lobule being formed of regularly disposed masses of what is termed lymphoid tissue, consisting of a meshwork of exceedingly delicate connective tissue, the meshes being crowded with round cells identical with the white corpuscles of the blood and lymph corpuscles. The functions of this gland are still undetermined. It is placed in the same category as the thyroid gland and spleen; and the most probable theory as to its use is that which assigns to it the work of elaborating the elements of the blood, especially in the earlier years of life. It is employed in organotherapy (q.v.).

Thyridop'teryx, a genus of foliage-destroying insects. See BAGWORM.

Thy'roid Gland, a structure having no outlet or duct, and classified with the spleen, thymus gland, and suprarenal capsules (qq.v.) under the general name of ductless glands. In man the thyroid gland is situated at the upper part of the trachea or windpipe, and consists of two halves or lobes, placed one on each side of the windpipe, and united by a narrow bridge of substance — the isthmus of the gland. It is covered in front by the muscles of the neck, and its sides lie in contact with the common carotid artery. Its under surfaces embrace the windpipe and larynx. This gland is of a reddish color. It is larger in women than in men, and weighs, on an average, about 1½ ounces. It may become enormously enlarged, as in goitre. Its structure consists of numerous small shut sacs, surrounded by a network of capillary blood-vessels. Each vesicle or shut sac is lined internally by a single layer of columnar cells, and is filled with a glairy mucoid substance. The blood-vessels of the gland are derived from the superior and inferior thyroid arteries, and its nerves come from the pneumogastric and sympathetic trunks. The use of this gland is not at all clear. Its business is connected with the maintenance of a proper quality of blood, either by the removal of certain effete substances from the blood, or by the addition of certain elements to it. Its complete extirpation or atrophy is attended with disease. The thyroid gland is utilized in organotherapy (q.v.).

Thyrse, thėrs, a form of inflorescence consisting of a compact panicle in which the middle pedicels are the longest, giving the whole an ovate shape. The primary pedicels are centripetal, and the secondary centrifugal. The horse-chestnut and lilac furnish examples.

Thysanu'ra, an order of neuropteroid insects. See BRISTLETAILS.

Tiahuanacu, tē-ä-wä-nä'koo, Bolivia, the ruins of a prehistoric city, near the south shore of Lake Titicaca, in lat. 16° 42′ S., lon. 68° 42′ W., about 40 miles west of La Paz city. The ruins stand on an eminence 12,930 feet above sea-level, which, from the water marks around it, seems to have been formerly an island in Lake Titicaca. The level of the lake, however, is now 135 feet lower, and its shores two miles distant. This fact, in conjunction with others, warrants the belief that these remains antedate any others known in America; they indicate a different and higher order of art than was found to exist at the time of the Spanish conquest, in any other part of that continent. The ancient Peruvians had but the vaguest traditions concerning them, believing that the structures of which they are the remains were raised in remote ages, by giants, in a single night. The chroniclers of the Spanish conquest have described them, and their accounts do not differ materially from those of modern travelers. They are in a state of extreme dilapidation. Some of the structures seem to have been built on a pyramidal plan, and to have covered several acres; but the most remarkable features still remaining are monolithic doorways, pillars, and statues of stone, elaborately sculptured in a style wholly different from any other remains of art yet found in America. One of these doorways is 10 feet high, 13 feet broad, with an opening six feet four inches by three feet two inches, the whole cut from a single stone. Its east front has a cornice, in the centre of which is a human figure of strange form, crowned with rays, interspersed with serpents with crested heads. On each side of this figure are three rows of square compartments, filled with human and other figures, of apparently symbolic design. The statues are broken, so that it is difficult to state their original dimensions; but these may be inferred from the size of the head of one, which is four feet in length and of proportionate width. The whole neighborhood is strewn with vast blocks of stone elaborately wrought, some of which measure three feet in length by 18 feet in width, and six feet in thickness. On some of the islands of Lake Titicaca are other monuments, of great extent, but of true Peruvian type, apparently the remains of temples destroyed on the arrival of the Spaniards. Those of the island of Coati, however, have many features in common with the ruins of Tiahuanacu, and probably belong to the same epoch, and are to be ascribed to the same unknown and mysterious people who preceded the Peruvians, as the Tulhuatecas or Toltecs did the Aztecs.

Tibaldi, tē-bäl'dē, **Pellegrino,** Italian painter and architect: b. Bologna 1532; d. Milan 1598. In 1547 he commenced his profound study of Michelangelo at Rome and painted for Cardinal Poggi, in his palace at Bologna, the 'History of Ulysses.' When Caracci saw these pictures, in which the style of Michelangelo appeared in a softened and refined form he pronounced Tibaldi *il Michelangelo Riformato* — an improved version of Michelangelo. He also decorated the chapel of Saint James for the Augustinians. Among his architectural works are the palace of Cardinal Borromeo at Pavia (1562); the Church of Saint Fidelis at Milan, and the new façade of the cathedral in that city. He likewise furnished Philip II. with the plan for the Escorial, and painted the ceiling of the library in that palace. Consult: Zanotti, 'Le Pitture di Pellegrino Tibaldi' (1532).

Tiber, tī'bėr (Italian, *Tevere*), Italy, a river rising in the Apennines of Tuscany, in central Italy, about 11 miles north of Pieve Santo Stefano. It is one of the largest and most celebrated rivers of the country, has a winding course, flows 260 miles, and empties into the Mediterranean, passing many noted cities on its way to the sea, which it enters by two branches — the Fiumicino, and Fiumara. It is navigable as far as the mouth of the Nera, a distance of about 90 miles. Its principal tributaries are the Nera and Paglia, which also receive their own affluents. The upper course is precipitous, and the mountain streams which supply its water, are the cause of its frequent overflow and consequent inundations. The chief cities on its route are Perugia, Orvieto, Ostia and Rome. The "yellow Tiber" is alluded to by Vergil.

Tiberias, tī-bē'rī-ạs, Sea of. See GALILEE, SEA OF.

Tiberius, tī-bē'rī-ŭs **(Tiberius Claudius Nero Cæsar),** Roman emperor, son of Tiberius Claudius Nero, and Livia, who was afterward married to the Emperor Augustus: b. 42 B.C.; d. Misenum 31 March 37 A.D. Brought up in the imperial household, Tiberius had by his conquests in Germany and Gaul gained the confidence of Augustus, by whom he was made a Roman consul. In 11 A.D. he was compelled to

divorce his wife, Vipsania Agrippina, in order to marry Julia, the emperor's daughter, and in 14 A.D., shortly before the death of the emperor, was formally adopted as his heir. According to Tacitus, the reign of Tiberius, although marked by cruelty and infamy which could have been possible to only the most profligate and dissolute of men, was rendered less tyrannous than might have been expected, by the strict maintenance of justice in matters of taxation and at times by a certain respect for the privileges of the senate, and the rights of the common people, to be commended in a period of absolute despotism. The atrocious disregard of human life and liberty wherever his own private interests were at stake could, however, scarcely have been equaled. It was in this reign that the crime of "læsa majestas" was established. Consult: Mommsen, 'The Roman Provinces from Augustus to Diocletian' (1886); Schiller, 'Geschichte der römischen Kaiserzeit' (1883).

Tiberius Con'stantine (TIBERIUS II.), emperor of Byzantium: b. Thrace; d. Byzantium 582 A.D. He was brought up by the Emperor Justin II., whom he succeeded on the throne of the Eastern Empire in 578. It was during his reign that the great influx of Huns and Slavs in the north and east, and that of the Lombards in the west, began seriously to threaten the Roman empire.

Tibet, tĭb'ĕt or tĭ-bĕt', or **Thibet,** a country of central Asia, under Chinese suzerainty, lying between lat. 28° and 36° N., and between lon. 79° and 103° E. It is bounded on the north by East (Chinese) Turkestan, on the east by China proper, on the south by British India, Bhutan and Nepal, and on the west by the Indian state of Kashmir. The area is estimated at about 812,000 square miles. Tibet forms the most extensive and loftiest plateau region in the world. It is structurally a complex of faulted mountains whose intervening valleys have been filled up with detritus, converting them into plains whose general level lies from 10,000 to 15,000 feet above the sea, while the mountains tower almost as high again above them. The main Himalaya range runs along the southwestern boundary, and the Karakoram with its outrunners traverses the western part of the country. These ranges have numerous peaks between 20,000 and 29,000 feet in height. On the northern boundary runs the Kuen-Lun Range, sending numerous spurs and offshoots into the plateau. The eastern half of Tibet is traversed by a system of more or less parallel ranges with a southeast trend. The enclosed plains in western and northern Tibet form closed drainage basins, very poorly watered, and containing salt lakes. The eastern longitudinal valleys are drained by the headwaters of the Yang-tse-kiang, Hoang-ho and Salwin rivers, and in the south, along the northern base of the Himalayas, run the Indus to the west and the Brahmaputra to the east. The climate is excessively dry, with great and sudden fluctuations in temperature, and severe cold and biting north winds in winter. The vegetation is scanty, and characteristic of desert and alpine regions. There are green meadows only along the streams, and in the eastern mountains are forests of birch, poplar, and coniferous trees. Wild animals are very numerous along the watered regions, and antelopes, yak oxen and wild asses are characteristic of the steppes.

The inhabitants, who number about 2,250,000, are of a semi-civilized Mongolian race somewhat akin to the Burmese. In the north they are nomadic, but in the south they are settled in substantial houses of stone or sun-dried brick, and cultivate the soil along the river valleys. The industries are not important, but there is a considerable trade with China, and wool, furs, musk, gold and precious stones are exported. The language of the people is similar to the Chinese, but has taken on polysyllabic characters. A considerable amount of literature, mainly religious, has been accumulated, and printing has been practised for centuries. The prevailing religion is Buddhism, of the form known as Lamaism. The priesthood is exceedingly numerous, and the government is a theocracy. At its head is the Grand Lama, or Dalai Lama, who resides at Lhasa (q.v.), the capital, and who claims to be the head of the Buddhist world. This priest government has enforced a strict exclusion of non-Buddhist foreigners, particularly from the capital. A Chinese resident is permanently stationed at Lhasa. Russian diplomatic influence seemed to have gained a foothold in Tibet when, in 1903, the British Indian government took the occasion of the non-compliance of the Tibetans with the terms of the Sikkim treaty of 1892, governing frontier trade relations, to send a military expedition across the boundary. The avowed purpose was to negotiate with the Tibetan government, but the latter declined to negotiate, and the British column pushed on toward Lhasa. On 31 March 1904 at Guru where the Tibetans had built a wall across the highway to oppose the advance, 1,500 of their soldiers were flanked and effectively enclosed in a circle. An attempt to disperse them, and make them retire without firing on them, was met by the Tibetan general wounding a Sikh by a pistol shot which was the signal for a general onslaught by the Tibetans. A terrible magazine rifle fire, and the bringing into action of a mountain battery resulted in the slaughter of about 400 of their soldiers, the British subsequently occupying their camp. The advance also met with serious opposition at the Karo-la, and at Gyantse jong or castle, where for a time they were besieged by thousands of Tibetans. The expedition eventually reached Lhasa: after long negotiations, ended only by the threat of enforcing compliance, Col. Younghusband concluded a treaty which was afterward censured by the Indian Government as in excess of his instructions. Consult: Landor, 'Tibet and Nepal' (1904); Landon, 'The Opening of Tibet' (1905).

Tibet Dog, or **Tibet Mastiff,** a breed of dogs about the size of a Newfoundland dog, but with a head resembling that of the mastiff, and having the flews large and pendent. The color is usually deep black, with a bright brown spot over each eye; the hair is long, and the tail bushy and well curled. This variety is extremely savage, and has been known from classic times, when it was employed by the Romans, especially under the emperors, in the games of the circus.

Tibia. See ANATOMY; OSTEOLOGY.

Tibul'lus, Albius, Roman poet: b. about 55; d. about 19 B.C. He belonged to the equestrian

order, and was on intimate terms with Messala, whom in 31 he accompanied in a campaign in Aquitanian Gaul. He set out with him thence to the East also, but was forced through ill-health to land and be left behind at Corcyra. Henceforth he lived on his estate, between Tibur and Præneste. Horace was warmly attached to him, and addresses to him one of his epistles, in which he credits his friend with the possession of a tender heart, beauty, wealth, good health, and good taste in enjoying life. We possess four books of elegies under his name, but the third and a part of the fourth are spurious. These poems are among the most perfect of their kind which have come down to us from classical antiquity. The elegies of Tibullus are characterized by agreeable simplicity and tender feeling, and are free from the insipid prolixity into which Ovid frequently falls. The chief editions are those of Lachmann (1829); Müller (1870); Bährens (1878); and Hilier (1885). There is a translation by Cranstoun (1872).

Tiburon, tē-boo-rōn, Mexico, an island in the Gulf of California, situated in the upper part of the gulf, 230 miles from the mouth of the Colorado River, and separated from the coast of Sonora by a channel from two to five miles wide. It is 30 miles long and from 10 to 20 miles wide, and covered with grass and desert vegetation. It is inhabited by the Ceris or Seris Indians, who have been left almost wholly to themselves by the Mexican government, and still live in a primitive state of nature. They are warlike and feared by the neighboring tribes on the mainland; use poisoned arrows, and are said to practise cannibalism.

Tic-douloureux, tĭk'doo-loo-rē'. See Facial Neuralgia; Neuralgia.

Ticao, tē-kow', Philippines, one of the islands of Masbate province, lying northeast of Masbate Island, and southwest of Sorsogón, Luzon, area 140 square miles, with dependent islands 149 square miles. It is long and narrow, extending 23 miles from northwest to southeast, and narrowing gradually from a width of eight miles in the north to the southern point Cape San Rafael; the surface is rugged with many small mountain groups, and single peaks; the highest elevation is 1,525 feet in the northwest. The west coast is steep and rugged, the east coast indented by several small bays. Hemp, rice, sugarcane, cotton, and chocolate are raised in small quantities; and gold is obtained from the river sands. The more important occupations of the people are stock-raising, weaving, fishing and hunting. Pop. 5,500.

Tichborne (tĭch'bôrn) **Trial,** a famous English lawsuit in which was contested the validity of the claim of one Thomas Castro that he was Roger Charles Tichborne, heir of the Tichborne estates. Roger Charles, the eldest son of Sir Alfred Joseph Tichborne, died at sea in 1854 and upon the death of the second son, in 1866, the youngest was acknowledged heir. But Lady Tichborne was not satisfied that her eldest son was really dead, and so she advertised for him. Castro, a butcher from Wagga Wagga, Australia, also known as Arthur Orton, of Wapping, came forward and claimed to be Roger, the rightful heir. He was accepted by Lady Tichborne, who, however, died before his suit to recover the estate began. The trial lasted 103 days and was ended by Castro being non-suited, 6 March 1872. He was arrested and charged with perjury and a trial of 188 days followed, a verdict of guilty being found 28 Feb. 1874. Castro was sentenced to 14 years' imprisonment with hard labor. He was discharged on a ticket-of-leave in 1884, confessed his imposture in 1895, and died in 1898. The second trial, which was the longest in the history of the English courts, cost £55,315.

Ticino, tē-chē'nō (German *Tessin*), Switzerland, a canton situated on the southern frontier of the republic, and bounded on the east, south and west by Italy. Area 1,088 square miles. The Saint Gotthard group of the Lepontine Alps forms the northern and the Adula Alps the eastern boundary. Ramifications of these fill up the canton, but are cut by the valley of the Ticino River. The latter drains practically the whole canton, and empties into Lake Maggiore, which extends some distance across the southern boundary. The canton thus belongs to the basin of the Po. The upper mountain regions are rocky, but the southern part of the canton is very fertile, producing grain, fruits, and grapes. Large numbers of goats are raised in the mountains. The principal mining industries are granite and marble quarrying. Commerce and manufactures are unimportant, although there is a considerable tourist traffic over the Saint Gotthard Railroad, which traverses the canton. The capital is Bellinzona. Pop. (1900) 138,243.

Ticino (German and French, *Tessin*), a river of Switzerland and Northern Italy, rising on Mount Saint Gotthard, and flowing in a general southeast direction, first as a rapid torrent through the canton of Ticino, then through Lake Maggiore, and finally as a clear, navigable stream on the boundary between Piedmont and Lombardy. After passing Pavia it joins the Po. Length, exclusive of Lake Maggiore, 108 miles.

Tick'ell, Thomas, English poet: b. Bridekirk, Cumberland, 1686; d. Bath, Somerset, 23 April 1740. He was educated at Queen's College, Oxford, a fellowship of which he held 1710–26. He was the friend of Addison, who introduced him both into the world of letters and public life, and on becoming in 1717 secretary of state made Tickell under-secretary. He held the office of secretary to the Lords Justices of Ireland from about 1725 till his death. He translated the first book of the 'Iliad,' not far from the time of the appearance of the first part of Pope's 'Homer.' Addison declared that Tickell's version was the best, while Pope professed to believe it the work of Addison himself and wrote in reply the famous satire on Atticus. But without doubt Tickell made his own translation, which Addison corrected. Tickell's longest poem is 'Kensington Gardens'; his most popular, the ballad of 'Colin and Lucy'; while his finest is the elegy to Addison prefixed to his edition of Addison's works (1721).

Ticket-of-Leave, a written license granted by the English government, whereby a penal convict was given his liberty for good behavior before the expiration of his sentence. It originated in the permit granted to prisoners transferred to the colonies, but it came into domestic use in England after 1840, when the colonies refused

to receive more convicts. Certain restrictions were imposed on the recipient, requiring that he report to the police at stated intervals until his term expired, that he should not make change of address without notifying the police, etc. The system was much abused in 1856, when, it is said, 2,666 convicts were thus liberated. During 1861–3 the crimes committed by this class were so numerous that in 1864 the Penal Servitude Act was passed, virtually abolishing the practice.

Tickle Grass. See GRASSES IN THE UNITED STATES.

Tick'nor, George, American historian: b. Boston 1 Aug. 1791; d. there 26 Jan. 1871. He was graduated at Dartmouth in 1807, and was admitted to the bar in 1813, but never adopted the law as an active profession. He lived in Europe 1815–19 for the purpose of pursuing his studies, and on his return was appointed to the Smith professorship of modern languages and literature in Harvard. In 1835 he resigned his professorship, and for the next three years traveled in Europe. On his return he devoted himself to writing a 'History of Spanish Literature,' published in 1849, in three volumes, a corrected and enlarged edition appearing in 1863. Its value was at once recognized by scholars and it has been translated into Spanish and German. He produced in 1863 a 'Memoir of Prescott,' the historian. Consult 'Life, Letters and Journals of George Ticknor' (1876).

Ticks and Mites, small arthropods usually considered to be an order (*Acarina*) of the class *Arachnida* (q.v.). They have the regions of the body the most completely coalesced of any articulated animals, for not only are the head and thorax more or less united to form a cephalothorax, but the latter is continuous with the abdomen, often without the slightest indication of the line of union, and except in a few cases the abdomen is entirely unsegmented. The mouth-parts usually form a piercing and suctorial proboscis composed of the cheliceræ and pedipalpi, the latter being made up in part of a jointed, usually tactile palpus, while the cheliceræ may be stiliform and unjointed or 2-jointed and clawed or chelate. Typically the mature forms or imagoes have four pairs of walking legs of from five to eight joints terminated by variously arranged claws, stalked or sessile suckers or pads; but the legs may be variously modified, reduced to mere tubercles, to two pairs or disappear altogether in some parasitic forms. Respiration is effected by means of simple or branched tracheæ opening by from one to three pairs of stigmatæ at the bases of the legs, or by means of a pair of air-sacs opening at the base of the proboscis or on the back or, in the absence of all special respiratory organs, may be purely integumentary. The alimentary canal is commonly a spacious sac which may be forked or much branched. In most cases there is no blood-vascular system. The sexes are separated, the generative ducts open on the base of the abdomen, and fertilization is accomplished through copulation. A few are parthenogenetic and sexual dimorphism is frequent. They are oviparous, ovo-viviparous or viviparous. The larvæ frequently differ greatly from the imagoes in appearance and habits and almost always have three pairs of legs. After a few molts, usually two, they form nymphs or pupæ which also may be very different, and after a single molt metamorphose into the mature form or imago. Mites and ticks are found in all parts of the world and under every variety of environment. Many are parasitic either temporarily or permanently, and on both animals and plants, a few are commensals in ants' nests, etc., others are predaceous, and seize and suck the juices from weaker animals, some live in decaying vegetable substances, many in damp earth, in moss or under the bark of trees, many are aquatic either in fresh water or the sea, and some of the marine forms descend to great depths. While most of the members of this order have no direct relation to human affairs, many affect our interests in important and manifold ways. Some, like the itch-mites, are the cause of annoying diseases of man and animals, some like the cattle ticks are the bearers of disease-producing parasites, some are seriously destructive to our crops or to manufactured food-products, etc.; and many are beneficial as destroyers of harmful insects and their eggs. Owing to their great powers of reproduction and their tenacity of life, the harmful species are difficult to combat, preparations of sulphur and lime or powerful insecticides applied directly to the colonies being the most effective remedies. The number of known species already amounts to thousands, although the smaller mites have been little studied outside of Europe. They vary in size from the microscopic mites to the large cattle-ticks about an inch in length. Differing greatly not only in habits and appearance but also in structure. The Acarina are divided by systematists into numerous families and subfamilies, of which a few representatives may be mentioned.

The *Oribatidæ* is an extensive family of 20 genera and 200 to 300 species of free-living forms with hard skins and robust bodies and usually three pairs of stalked stigmatæ and simple tracheæ. They are mostly vegetable feeders, never parasitic and with the exception of a few aquatic forms live in damp earth under leaves, bark, etc.

The *Gamasidæ* are somewhat similar, with rounded bodies and a hard skin, but have only a single pair of stigmatæ at the base of the second pair of legs. The blood system is well developed. They often swarm on the under side of rove-beetles, carrion-beetles, and other insects and some are parasitic on bats and birds; 35 genera and perhaps 200 species are already known.

The *Ixodidæ* are the ticks, large blood-sucking species, with ovoid bodies and leathery skin capable of great extension. They are temporary parasites of vertebrates, chiefly of birds and mammals. As a rule the eggs are deposited in the ground; the newly hatched larvæ have three pairs of long clawed legs with which they attach themselves to a host, insert the beak and suck the fluids. When ready to slough they may drop off, seek concealment until the skin is changed, when the same maneuver is repeated. After passing the larval and nymphal states the imagoes live among herbage and shrubbery and upon opportunity again attach themselves, but usually in pairs, to some warm-blooded host, inserting the strong beak and drawing blood while copulation takes place. The fertilized female

becomes greatly distended, often to a spherical form, drops off and deposits her eggs, often to the number of 20,000 to 30,000. The large cattle-tick (*Boophilus bovis*) of the western ranges, now known to be the intermediate host of the parasite of Texas fever (q.v.) and a great scourge to cattle and other animals, is an example. Others are the wood-tick (*Ixodes unipunctata*), so common in New England, and certain European species, one a parasite of poultry and introduced into the United States, as the related dove-tick also has been.

The *Hydrachnidæ* are the attractive and familiar water-mites, another large group of 40 genera and about 500 species. The adults, remarkable for their sexual dimorphism and brilliant colors, suck the juices of small crustaceans while the young are parasitic on aquatic insects and mussels. The brilliant scarlet eggs of some species are frequently found attached to aquatic plants and stones in a mass of jelly. A related family containing mostly marine predaceous forms is the *Halacaridæ*. An allied family is the *Trombidiidæ*, including the scarlet mites and the red spiders so well known to horticulturists. A very common one is *Tetrarhynchus telearius*, which spins a web on the under side of leaves and is very destructive to plants during hot dry weather. Others cause great damage to orange and lemon groves. The young are parasitic on insects.

The disgusting itch-mites form a family (*Sarcoptidæ*) of short, rounded forms which lack eyes, tracheæ, and stigmatæ altogether. They are microscopic and burrow in the skin of various animals, causing the diseases known as itch and mange, which are very difficult to eradicate but usually yield to persistent applications of sulphur washes. No less than 68 genera and 550 species parasitic on mammals, birds and insects have been described. (See ITCH.) Sheep-scab and mange in various domestic animals are caused by related mites of the genera *Psoroptes* and *Symbiotes*. They all have the feet wonderfully provided with adhesive organs in the form of hooks, bristles, and sucking cups. Closely allied are the *Tyroglyphidæ*, comprising perhaps 50 species of minute forms with biting jaws. They are chiefly remarkable for their great reproductive capacity and the enormous numbers in which they occur in slowly decomposing vegetable substances, etc. Here belong the cheese-mites (*Tyroglyphus siro* and *T. longior*) which are cultivated and sown in certain cheeses in order to give them an appearance of maturity and an acid flavor. Many similar species infest stored grain, dried fruits, etc., and some, like *Alcurobius* and *Rhizoglyphus*, destroy living roots, bulbs and grains. Another one abounds in unrefined sugars.

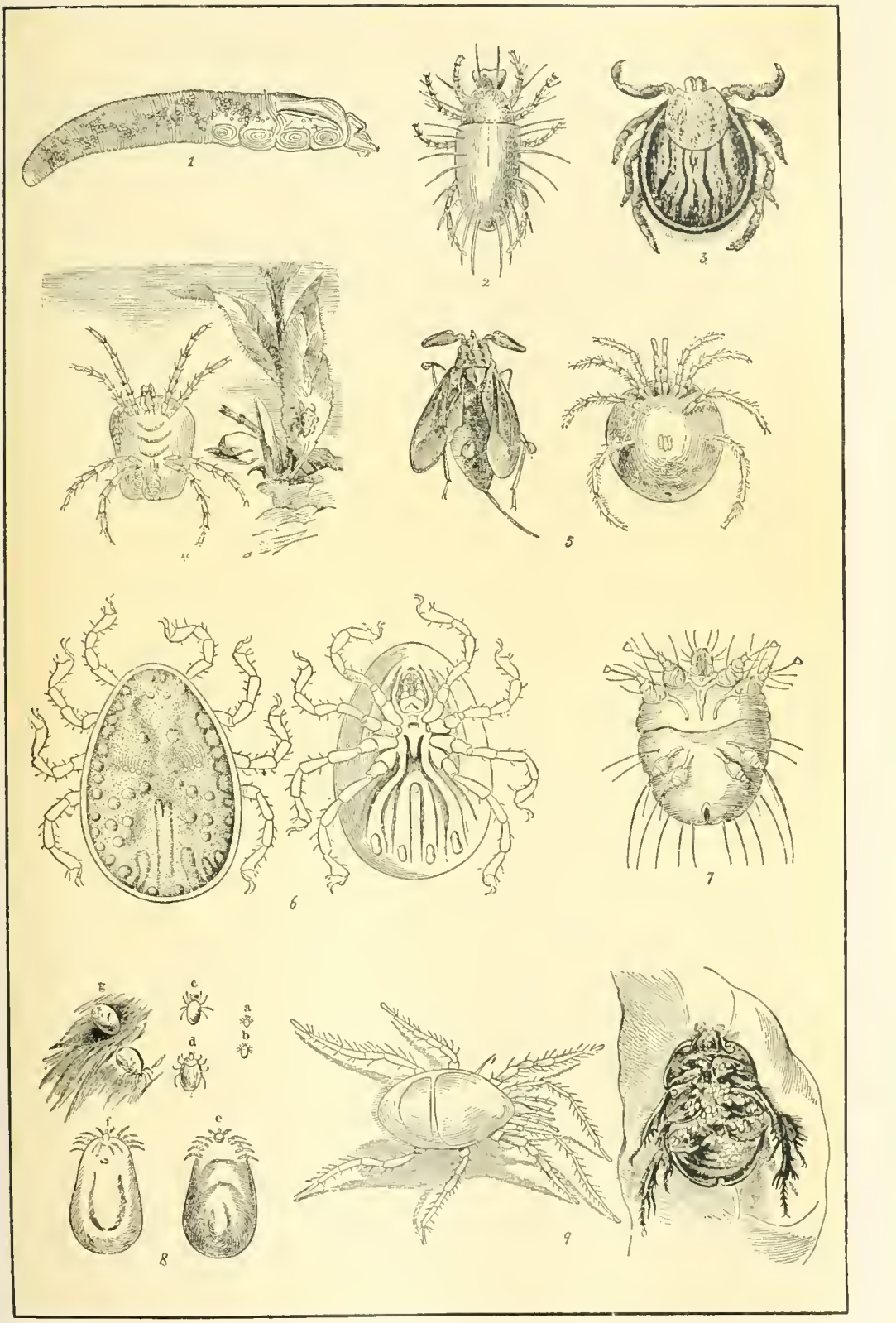
Two strictly parasitic families in which the body has become elongated and worm-like and otherwise degenerate are *Demodicidæ* and *Eriophydidæ*. The former live in the hair follicles and skin glands of man and domesticated animals. *Demodex folliculorum* sometimes causes the «blackheads» which appear about the human nose; similar species infest the pig, dog, sheep, ox and other animals. That of the ox sometimes so perforates the skin that it has little value for leather. In these forms the legs are very small and degenerated and one pair may be lost. The second family is that of the gall-mites which have but two pairs of legs, the posterior being sometimes represented by bristles. They form galls in the buds and leaves of plants whose juices they suck. Most of the species are confined to a particular species of plant, so that the 235 which have been described are probably but a small representation of those actually in existence. Some are parasitic in the galls made by others, recalling the inquilines among the gall flies.

Consult: Trouessart, 'Revue sciences naturelles de l'Ouest' (1892); Michael, 'British Oribatidæ' (London 1883–7); 'British Tyroglyphidæ' (London 1901); Banks, 'Transactions American Entomological Society,' XXI.; Walcott, 'Hydrachnidæ,' Studies Univ. of Nebraska, No. 34; Packard, 'American Journal of Arts and Science,' 1871; Banks, 'Red Spiders of the United States,' Bulletin Dept. of Agriculture, Washington, 1900; Nuttall, 'Insects as Carriers of Disease,' Johns Hopkins Hospital Reports, 1900; and the monographs since 1898 in Schultze's 'Tierreich,' Berlin; Murray, 'Economic Entomology, Aptera' (London).

J. PERCY MOORE,
University of Pennsylvania.

Ticonderoga, tī-kŏn-dē-rō'gą, N. Y., village, Essex County; on the stream which is the outlet of Lake George, and on the Delaware & Hudson Railroad; about 95 miles north by east of Albany, and a short distance from lakes Champlain and George. In the vicinity are rich deposits of crystalline graphite, the chief source of the supply in the United States. The village is in an agricultural region. The good water-power is utilized to some extent for manufacturing. The chief manufactures are lumber products, wood pulp, paper, and dairy products.

The history of Ticonderoga and vicinity begins with the early settlement of Vermont and northern New York. In 1755 a fort was built here, by the French. They called it Fort Carillon, on account of the caroling or chiming of the waters. The value of the site, near the head of Lake Champlain and at the entrance to Lake George which, with a short portage, formed a waterway to the Hudson, was recognized by both the French and English. Two years after the erection of Fort Carillon it was garrisoned by a force of 9,000 men under Montcalm. Wishing to extend the power secured by so advantageous a position, Montcalm attacked and captured Fort William Henry on Lake George. In July the following year General Abercrombie attempted to capture Fort Carillon, and although he had a force of 15,000, he was unsuccessful; his loss was about 2,000. In 1759 another and successful effort was made to wrest the fort from the French; General Amherst with a force of 12,000 captured both Carillon and Crown Point. After the beginning of the Revolutionary War, the whole region bordering on Lake Champlain, Lake George, and the Hudson River became a battle ground. On 10 May 1775, a small force of Americans under Ethan Allen (q.v.) captured the fort, then called Ticonderoga. Burgoyne's plan of campaign included regaining this fort, and on 30 June 1777 he endeavored to capture the Americans, but failed. On 5 July of the same year, he made another attempt and this time succeeded. Later other engagements took place here and in the vicinity, but the English kept possession until after the surrender of



1. Follicle Mite or "Blackhead" (Demodex homonis).
2. Cheese Mite (Tyroglyphus siro).
3. Tick (Ixodes reduvius).
4. Scarlet Mites (Trombidium holosericeum).
5. Water Mite (Atax Spinipes).
6. Pigeon Tick (Argas reflexus).
7. Itch Mite (Sarcoptes hominis).
8. Tick (Ixodes ricinus).
9. A Beetle Mite (Gamasus coleoptratorum) at the left shown enlarged; at the right, devouring a beetle.

Burgoyne. In 1780 an English force occupied the fort for a short time. At the close of the wars with England the fort ceased to be of importance, and as it was not occupied it soon became a ruin. Near the village stands a part of the gray stone walls of the old fort. Many tourists visit the village each year, and it has some note as a summer resort. Pop. (1890) 2,267; (1900) 1,911.

Ticonderoga, Expedition Against, an incident in the American Revolutionary War. At Ticonderoga, a small town in what is now Essex County, New York, the French built a fort in 1755, which they named Carillon. In 1757 it was the headquarters of Montcalm and was unsuccessfully assaulted by Gen. Abercrombie 1758. It was captured after a siege in 1759 by Gen. Amherst who, at great cost made a British stronghold of it. It was surprised and captured by the American militiaman, Ethan Allen, in 1775. He had determined to capture the fortress, and although he held no commission from the Continental Congress, which in fact had not yet convened, he set out with a force of less than 100 of his "Green Mountain Boys" and arrived at Ticonderoga just at daybreak. The British commander was caught unawares and, thoroughly frightened at the order to immediately surrender "in the name of the Great Jehovah and the Continental Congress!" did as he was bid, and turned the stronghold over to the intrepid American.

Ticpolon'ga, the name in Ceylon of Russell's viper (*Daboia russellii*) common in the south of India, Ceylon, and Burma. See Russell's Viper.

Tics, spasmodic contractions of muscles, especially those which occur in the muscles of the face. Such affections are characterized by painful muscular twitching. The term tic, as referring to facial spasm, is especially applied to tic-douloureux. See Facial Neuralgia.

Ticuna, te-koo'nä, **or Tucuna,** too-koo'nä, a tribe of aboriginal Indians found in the forests of Brazil and Peru, around the confluence of the Javary and Marañon or Upper Amazon. They are of slender but good physique, have dark skins, and live in a state of nature, their sole adornments being feather armlets and monkey teeth necklets. They live by fishing and hunting, and are distinguished for their honesty and straightforward dealings. Their birth, death, and other ceremonials and customs are interesting.

Tidal Motor, a motor for use in a tidemill (q.v.). A typical example of the modern tidal motor consists of a turbine of an improved model, designed to utilize a large flow with a moderate diameter. One such, having vanes 13 feet in internal diameter, with a minimum head of five feet three inches, at a speed of fifteen revolutions per minute has a capacity of 300 horse-power. The speed is maintained by the use of regulating sluices which keep constant the flow into the turbine. See Tidemill. Consult the paper by P. Decœur in the 'Proceedings of the Institute of Civil Engineers' (1890).

Tidemand, Adolph, Norwegian painter: b. Mandal 1814; d. Christiana 1876. He studied at Copenhagen and at Dusseldorf under Schadow, afterward going to Munich and Rome. Among his works are the large historical compositions 'Gustavus Vasa Addressing the Dalecarlians' and 'Devotional Meeting of the Haugainer,' and many genre subjects, such as the cycle of ten pictures illustrating 'Norwegian Peasant Life'; 'Grandmother's Bridal Crown,' and 'The Wolf Hunter's Tale.' He was for many years painter to the king.

Tidemill, a water-mill so constructed as to utilize the action of the tide. This is usually accomplished by one of two methods. The first consists of shutting off the water in a reservoir at flood tide, its escape through a race-way giving the motion to the mill. In such tidemills the return of the tide through the sluice may also be utilized. The other and less expensive method involves the placing of a horizontal wheel in the water to be turned by the current either in ebb or flow. The motion of this mill is not uniform; it attains its greatest velocity at half tide and is suspended entirely at the turn of the tide; but with exception of this suspension a uniform velocity can be obtained through the use of regulative machinery. The old London tidemills, in use in the river Thames, were built on a platform which was entirely afloat, waterwheel, mill-room and all. Tidemills have never attained any great success owing to the inconvenience of harnessing the motive power. But in a recently projected mill in the estuary of the Seine an attempt is made to obviate this difficulty by the use of an ingeniously constructed tidal-motor (q.v.).

Tides. 1. *Introductory.* Persons living along the seashore are familiar with a semi-daily rising and falling of the waters, which, although generally amounting to only a few feet, often suffices to cover and bare by turns wide stretches of the sea-shore. Without tide tables, or any knowledge of the moon's position, the approximate time of the tide can be foretold from its observed time of occurrence on a previous day, by allowing 50 minutes for its daily retardation. Toward and after the time of Cæsar, the Romans were well acquainted with ocean tides as the writings of Cæsar, Seneca, Pliny the Elder, Claudianus, and others clearly show. By referring the tides to the attraction of the moon and sun, Newton took the first important step in their explanation. Since his time important investigations of the laws of the tides have been made by Laplace, Airy, Kelvin, and G. H. Darwin.

2. *Definitions, etc.*— The tide is the periodic rising and falling of oceanic and other large bodies of water, due mainly to the attraction of the moon and sun as the earth rotates upon its axis. Remarkable stages of the water level at a given place, whether due to earthquakes, gales, or other causes which probably have no definite law of recurrence, although popularly known as "tidal waves," cannot be regarded as belonging to tidal phenomena. The rising and falling is accompanied by, and depends upon, lateral or horizontal movements of the waters called tidal currents or tidal streams or the flow and ebb. Their periodic character distinguishes them from ordinary ocean currents. The tide rises until it reaches a maximum height called high water and then falls until it reaches a minimum height called low water. The difference in height between a high and a low water is called a range of tide. At most ports two

high waters and two low waters occur each lunar day. The average length of a lunar day is 24 hours 50 minutes 28 seconds. The interval of time between the transit of the moon across the meridian and the occurrence of high or low water is called a lunitidal interval. The average value of the high-water lunitidal interval at any seaport, is sometimes called the corrected establishment to distinguish it from the high-water lunitidal interval on the days of new and full moon, which is known as the establishment, or the vulgar establishment, of the port.

At the times of new and full moon the tidal forces of the moon and sun act in the same direction, whereas at first and last quarters they oppose each other. When they unite their forces we have spring tides, characterized by large ranges of the tide; when they are opposed, neap tides, having small ranges. The spring and neap tides usually occur soon after the corresponding phases of the moon. The interval is called the retard or age of the tide, or age of the phase inequality, and is usually less than 60 hours. The lunitidal intervals have their mean values at the times of spring and neap tides; the tides occur a fraction of an hour earlier between spring and neap tides, and later between neap and springs. Other things being equal, the range of tide is greater than usual by about one sixth part when the moon is near perigee and about as much less than usual when near apogee. An increase or decrease of about one tenth part of the range occurs when the moon is near the equator or near its point of extreme declination, respectively.

Diurnal inequalities among the four tides of a day are due to the presence of a diurnal wave or partial tide, whose period is approximately 24 hours. The cause of this wave lies in the fact that if the moon is north or south of the equator, its tidal forces are somewhat different both in magnitude and in direction when two times half a lunar day apart are compared.

3. *The Tidal Forces.*— All particles of the earth (the seas included) will continue to occupy positions fixed relatively to one another if no other forces are impressed upon them than the following: The earth's attraction; its centrifugal force of axial rotation; and a force acting upon all of its particles alike, for example, the centrifugal force due to the revolution of the earth about the centre of gravity of earth and moon. If an extraneous force does not act upon all particles alike, then motions will be set up in the yielding parts. The attraction of the moon upon a given particle (near the surface, say) is along a line drawn (at any given instant) from the particle to the moon's centre; its intensity, which is inversely proportional to the square of the distance, and its local direction (that is, direction with respect to the earth's surface) continually change as the earth rotates upon its axis. The attraction of the moon upon a particle at the earth's centre (or upon the earth as a whole) is along a line drawn from the earth's centre to that of the moon; it is independent of the earth's axial rotation. Because the action of the moon upon the surface particle differs from its action upon the particle at the earth's centre there results a tendency to produce motion relatively to the earth's centre. A consideration of this tendency will enable us to answer the question why there should be two high waters each lunar day, instead of only one high water. In a single sentence, the reason is that the moon attracts the waters on the hemisphere facing the moon more powerfully than it does the earth; but attracts the earth in general more powerfully than it does the waters on the farther side of the earth. The difference between the action of the moon at any point of the ocean and its action on the centre of the earth is the tide-producing force at the specified point. It is not difficult to show that, to higher powers of the small quantity a/r, the vertical and horizontal components of the moon's tide-producing force are very nearly $\frac{M}{E}\frac{a^3}{r^3} g\,(3\cos^2\theta - 1)$ and $\frac{3}{2}\frac{M}{E}\frac{a^3}{r^3}\sin 2\theta$, respectively, where M denotes the mass of the moon, E that of the earth, g the force of gravity, a the mean radius of the earth, r the distance between centres of earth and moon, and θ the zenith distance of the moon corrected for parallax. The numerical value of $\frac{M}{E}\frac{a^3}{r^3}$ when r ha. its mean value is 0.000000056; and so the vertical force has a range of 0.000000168g, as has also

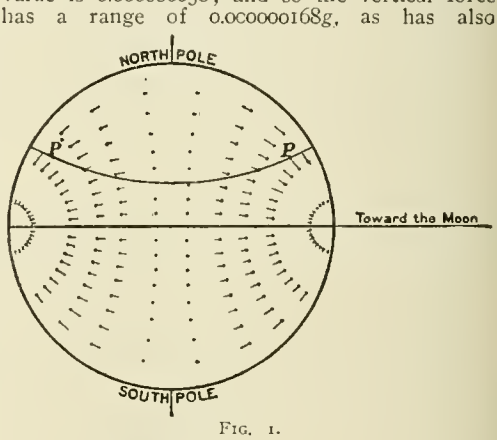


FIG. 1.

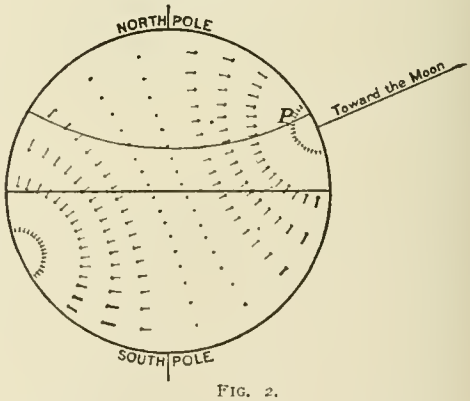


FIG. 2.

the horizontal force. The solar tidal force is 46 per cent that of the lunar. The tides are mainly due to the horizontal component of the forces. These are the forces which deflect a plumb line, although by an amount so small that

it can hardly be measured. The deviation, in case of the moon, amounts to only 0."017 either way from the mean vertical. For a sufficiently deep body of water extending 163 nautical miles along the equator the range of tide at either end will be one inch.

The system of arrows in Figs. 1, 2, 3 are intended to represent the horizontal component of the moon's tide-producing force at various places on the earth's surface. The arrows located upon the same small circle are supposed to be of equal length, and all arrows are supposed to lie in a system of great circles which meet in a point directly under the moon and, of course, in the antipodal point. At these two points and along a great circle midway between them the length of the arrows is zero; in other words, the force vanishes. The system of arrows is fixed with respect to the moon, and so sweeps over the surface of the earth as the moon performs her apparent daily revolution. The system shifts somewhat when the moon is north or south of the equator. At any point P on the earth's surface, the moon being upon the equator, the horizontal forces are equal in

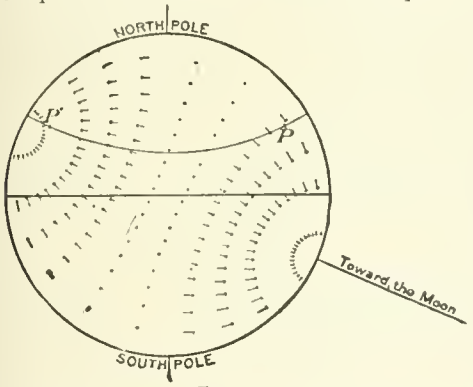


Fig. 3.

magnitude and direction to the horizontal forces at P', a point upon the same parallel of latitude as P, but 180° distant in longitude; or, what amounts to the same thing, they repeat themselves at any given point P every half lunar day, or 12h. 25m. 14s. on an average. But when the moon is not upon the equator, the forces are generally not the same at P and P', either in magnitude or in direction, and so do not exactly repeat themselves every half lunar day. This alternation of the forces gives rise to a diurnal inequality in the tides. It will be noticed that for places situated upon either side of the equator, the forces have, when the moon is upon the equator, a meridional component directed from the poles toward the equator, and that this component nowhere points from the equator toward the poles; consequently the existence of the moon causes the water (half-tide level) at the equator to be higher than it would otherwise have been. The moon's movement in declination therefore causes a fortnightly fluctuation in half-tide level. Similarly the sun produces a semi-annual fluctuation.

4. *Real Equilibrium Tides.*— If in the case of any body of water, its free period be several times smaller than the period of the tidal forces, say less than three or four hours, the surface will at every instant be normal to the plumb line as disturbed by these forces. In particular, consider the mean lunar semi-diurnal tide of a deep lake situated in north latitude. Upon referring to Fig. 4 it may be inferred that high water will occur at a point south of the no-tide point when the moon is on meridian; at a point west of the no-tide point at 3 o'clock, lunar time; at a point north of it, at 6 o'clock; at a point east of it, at 9 o'clock. The no-tide point is the centre of gravity of the surface. This theory nearly explains the tides found in Lake Superior and the semi-diurnal tide in the eastern portion of the Mediterranean Sea; it partially explains the semi-diurnal tides in the Gulf of Mexico and the Caribbean Sea, and the diurnal tides in the Atlantic Ocean east of the United States.

5. *Hypothetical Equilibrium Tides.*— If a spherical body like the earth were entirely covered by an ocean so deep that its free period of oscillation would be several times smaller than the period of the tidal forces, the tidal forces of the moon would cause the surface of the ocean to assume the form of an ellipsoid of revolution with the longer axis pointing toward the moon's centre. For any zenith distance (θ) of the moon the height of the tide above the undisturbed spherical surface becomes

$$\frac{1}{2}\,\frac{M}{E}\,\frac{a^3}{r^3}\,\frac{a}{1-\frac{3}{5}\,\sigma/\delta_e}\,(3\cos^2\theta-1)$$

where σ denotes the density of the water and δ_e that of the earth. The numerical value of $\frac{M}{E}\,\frac{a^4}{r^3}$ is 1.17 feet. The corresponding value for the sun is 0.54 foot. If the $\sigma/\delta_e = 0$, the range of the hypothetical lunar tide becomes 1.8 feet; if $\sigma/\delta_e = 1$, the range becomes 4.4 feet. In case of the earth $\sigma/\delta_e = \frac{2}{11}$.

The hypothetical tide just described can be easily calculated for any time and place and is known as the uncorrected equilibrium tide. It bears no resemblance to the actual tide of our oceans.

6. *Some Dynamical Questions Involved in the Subject.*— Because the requirements for equilibrium tides are seldom found in the oceans, their waters must be treated as aggregates of heavy particles performing some kind of oscillatory motion. A progressive free wave in a canal has as its velocity of propagation $\sqrt{g\,h}$ and for the maximum velocity of the water particles $A\sqrt{\frac{g}{h}}$ where h denotes the undisturbed depth of the water and A the amplitude of the vertical movement. The longest or fundamental period of free oscillation of a rectangular area or sheet of water is

$$\text{period} = \frac{\text{twice length of sheet}}{\sqrt{g\,h}}.$$

Sheets tapered or sharpened at the ends oscillate more rapidly than do rectangular ones of the same length, while sheets narrowed at the middle or broadened at the ends oscillate less rapidly. The free oscillations of a given body of water can often be approximately determined by comparing with a more simple body whose motion is known. The given body need not have a strictly uniform depth nor be completely surrounded by land.

The general equations of motion for matter upon a rotating sphere show that a moving particle is deflected to the right in north latitude, to the left in south latitude, by a force whose numerical value is velocity $\times 0.0001458$ sin (latitude), the velocity being expressed in feet per second (Ferrel's law). This divided by g or 32.1722 gives the transverse slope which a river, or strait through which there is a current, will assume on account of the deflecting force of the earth's rotation.

7. *Hypothetical Dynamical Tides.*— The case of an equatorial canal encircling the earth is simple and instructive, although bearing no resemblance to any existing tidal body. If the depth of the water be greater than 67,000 feet, high water will occur when the moon is on meridian (above or below the horizon); if less than 67,000 feet, low water will occur when the moon is on meridian. For the depth 67,000 feet the range of tide will become very large. If this depth be greatly increased, the range will approach its equilibrium value, which is 1.8 feet for the lunar tide; if this depth be greatly diminished, the range will approach the value $0.000{,}026\,h$, h denoting the depth. In the latter case the amplitude of the horizontal displacement will be 137 feet. For the depth of 10,000 feet the range of tide is 0.31 foot and the amplitude of the horizontal displacement 161 feet; for the depth of 20,000 feet the corresponding quantities are 0.74 foot and 196 feet, respectively. If friction proportional to the velocity be introduced, the effect will be to displace the crests of the lunar and solar wave with reference to the moon and sun, but by unequal amounts. To this has been attributed the age of the tide.

8. *A Partial Explanation of Ocean Tides.*— From §§ 3, 4 an idea of the magnitude of the equilibrium tide can be obtained. It represents the direct effect of the action of the moon upon the waters where the body is so small and deep that its motion can be ignored. In a larger body whose free period is quite different from that of the tidal forces it is reasonable to suppose that tides even smaller than the equilibrium tides will be raised. In § 7 this was found to be the case for an equatorial canal of moderate depth encircling the earth. Again, if a canal, bounded at each end, be so shallow that a wave-length (λ) extends through only a few degrees of a great circle, then even if its length approximates to λ, the tides are obviously small because the tidal forces act very nearly alike on both halves, while the particles move in opposite directions in the two halves. Results like these contrasted with those obtained from observing the tides of the oceans lead to the belief that, as a rule, the ocean tides as we know them are so great that they can be produced only by successive actions of the tidal forces upon oscillating systems each having, as free period, approximately the period of the forces, and each perfect enough to preserve the general character of its motion during several such periods were the forces to cease their action.

That oscillations according to one of the free periods may persist for a long time can be seen in the case of some seiches; for, although probably started by a meteorological disturbance and sustained by no periodic force, yet in some harbors, straits, or bays they execute a large number of oscillations before dying out, and their periods are fairly constant in such cases. If a suitable harbor can continue to oscillate for possibly a day or two because of the inertia of the water, it is clear that an oscillation can be sustained in a large body, like a portion of

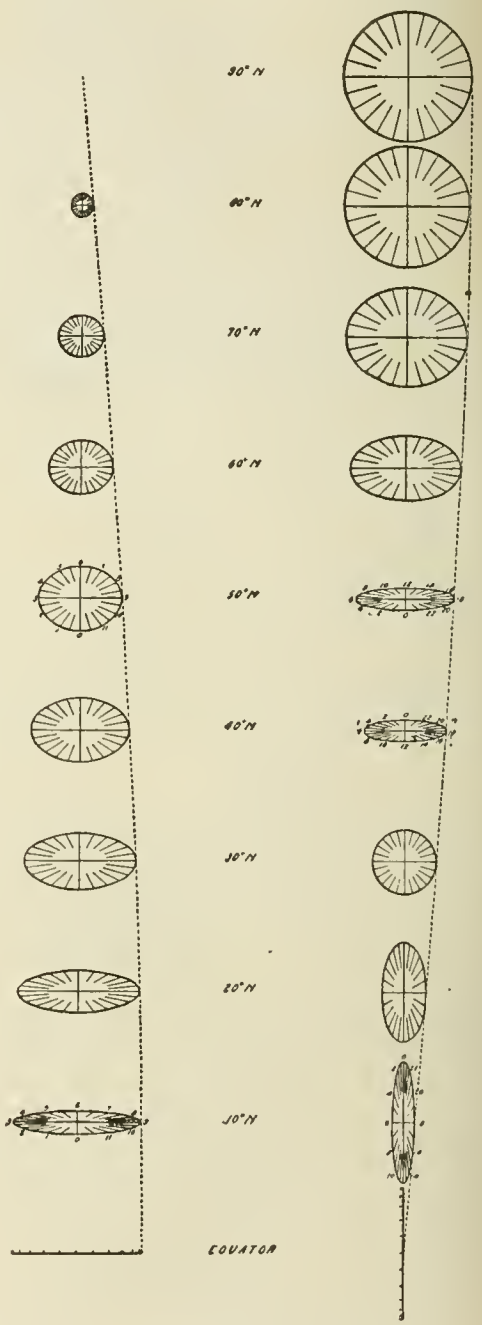
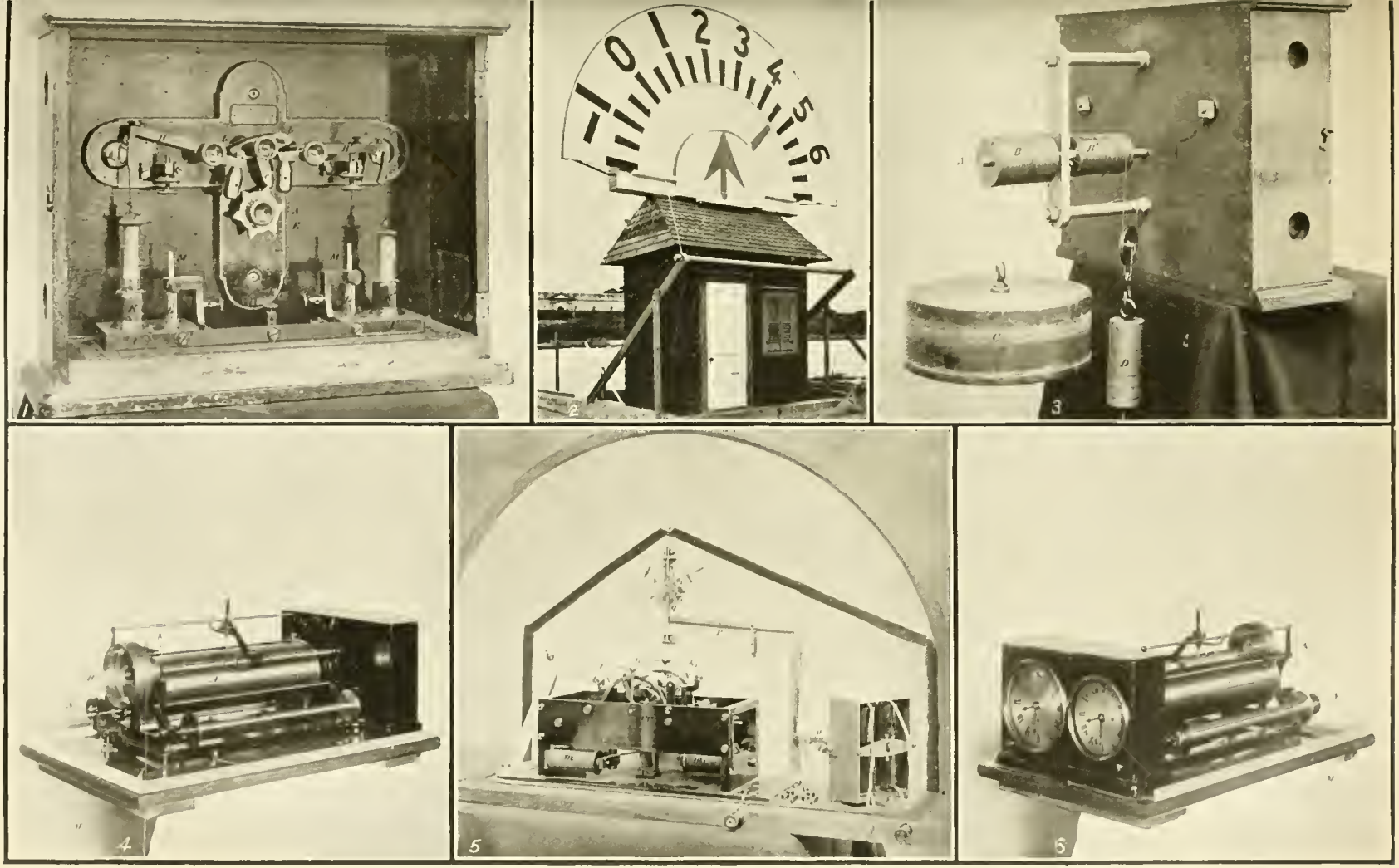


FIG. 4.— Semidiurnal and Diurnal Tidal Forces.

one of the oceans, by a very small periodic force provided that the free period of the body is nearly equal to the period of the forces and that the boundaries are such that no great



1. Interior of Transmitter. 2. Tide Indicator at Fort Hamilton, N. Y. 3. Rear View of Transmitter, Showing Float and Counterpoise Weight.
4. Rear View of Self-Registering Tide Gauge. 5. Receiving Instrument. 6. Front View of Tide Gauge.

amount of energy is carried away by progressive waves or otherwise.

Suppose the oceans by reason of their depths and the configuration of shore lines to contain several such systems whose free periods are nearly the periods of the tidal forces. These systems generally consist of still more simple sheets having like periods and which may be styled "areas." The times of tide can be found by means of the following rule:

If to the particles of water in a given oscillating system, each area of uniform depth, and wherein the resistances are proportional to the velocities of the particles, a series of simple harmonic forces having for period the free period of the body of water be applied, and a permanent state established, then must the time of elongation be simultaneous with the time when the virtual work of the external periodic forces upon the system becomes zero.

The forces in various parts of the system and at various times or hours are those of Fig. 4, projected upon the lines of motion of the particles. The virtual displacements are the same at each assumed hour, but differ in different parts of the system.

9. *Cotidal Lines.*—Although the cotidal lines in the ocean are generally real and distinct, they seldom indicate the progression of a wave at the rate due to depth; such progressions, however, exist in many shallow arms of the sea, particularly in tidal rivers. Because the principal ocean tides are due chiefly to stationary oscillations, as has just been pointed out, we may expect to find extensive regions characterized throughout by nearly simultaneous tides. For that portion of the Atlantic coast of America extending from Rhode Island to the Bahamas and Haiti, high water occurs almost simultaneously. The same is true for southeastern Alaska and the Gulf of Alaska; for the Pacific coast of Central America, and for the eastern coast of the Philippines. The time of tide changes but little along the Atlantic coast of Morocco and Portugal. In localities like these the rise and fall amounts to several feet even off shore and in deep water.

The Arctic Ocean is characterized by progressive tides of small range derived from the Atlantic Ocean.

10. *Peculiarities of Tides.*—The distance between the Antarctic Continent and Australia being more nearly equal to the half length of a solar wave than of a lunar, causes the solar wave to be comparatively large along the southern coast of Australia. The same is true, but in a lesser degree, for the region between the Antarctic Continent and South Africa. The distance from the Antarctic Continent to the Atlantic coast of the United States being a little more than 1½ lunar wave-lengths causes the ratio of the solar to the lunar wave to be comparatively small along this coast. If the ocean oscillate differently for different constituents, we can readily see reasons for considerable differences of epoch and so for remarkable "ages" of the tides.

If a tidal river be so shallow that the range of tide is a considerable fraction of the depth, ordinary wave-like oscillations of the water are no longer possible. The result is that as the wave progresses, the duration of the rise will be shortened and that of the fall lengthened. An extreme case results in a phenomenon called a *bore*—an advancing wave of water, which may be several feet in height, flowing up the bed of a river. The bore is a striking feature of the rivers emptying into the headwaters of the Bay of Fundy, which are nearly dry at low tide, but converted into navigable waters by an inflowing torrent at high tide. Various other peculiarities in the shape of the wave are due to the shallowness of the water. A much contracted entrance to a bay not only reduces the range within, but alters the shape of the wave.

On the other hand, the range may increase as the tide passes up a funnel-shaped bay or estuary, and especially may this be the case when the bay has a large stationary oscillation related to the waters outside. The Bay of Fundy has at its head a spring range of nearly 50 feet, which fact depends upon both of these circumstances. But the large tides in Bristol Channel, England, and in Bristol Bay, Alaska, are due chiefly to the contracting and shoaling of these bodies.

As a rule strong tidal currents occur in straits, tidal rivers, over shoals, and off capes.

11. *Observation of Tides.*—The height of the tide, or water surface, at any given time can be directly observed upon a graduated fixed staff if the water be tolerably smooth. A long box fixed in a vertical position, having a small opening near the lower end, and usually supplied with a float, enables one to observe during stormy weather as well. In some instances only the times and heights of the high and low waters are observed and recorded. But a more satisfactory record is obtained by reading the gauge at regular intervals one hour or one-half hour apart.

Automatic or self-registering gauges are usually constructed for drawing a continuous curve. Such a gauge consists of a float and box, a timepiece, and some form of recording apparatus. The record from an automatic gauge can be procured with comparatively little trouble; it shows clearly the peculiarities of the tide; and it furnishes material for a thorough analysis or discussion.

The velocities and directions of tidal streams are usually ascertained by aid of a float and line or some form of current-meter. Such observations are attended with considerable difficulty because they must generally be made at some distance off shore.

12. *Analysis of Observations.*—If only the high and low waters are to be treated, they are first referred to the moon's transit for obtaining lunitidal intervals. The ranges of tide are found at the same time. The intervals and the heights or the ranges are next classified according to certain astronomical arguments for the purpose of bringing out the corresponding tidal inequalities.

The harmonic analysis rests upon Laplace's principle of forced oscillations, namely:

The state of any system of bodies, in which the primitive conditions of the motion have disappeared through the resistances which the motion encounters, is coperiodic with the forces acting on the system.

Here is the clue to what oscillations ought to be found in the tidal wave; for, there ought to be an oscillation corresponding to each term of the causes producing the tide. Such terms follow from the development of the tide producing potentials of the moon and sun. Their arguments and "speeds" involve simple combinations

of the mean longitudes and mean motions of the local meridian projected on the celestial sphere, the moon, the sun, the equinox, the lunar perigee, the solar perigee, and the moon's node. There are three principal classes of terms: semidiurnal, diurnal, and long-period.

If for a sufficiently long time the observation curve be read and summed with reference to any constituent or component defined by its "speed," the effects of the other components will gradually disappear and the final sums will pertain only to the one sought (including, of course, its harmonics). To avoid reading the curve with reference to each component, the tabulation according to mean solar time is made to serve for all. This is done by distributing the (solar) hourly heights among the component hours as nearly as possible. Tables showing the proper distribution of hourly heights as well as blank forms into which the heights are to be copied have been used quite extensively. For nearly 20 years perforated sheets, known as stencils, have been used for pointing out which hourly heights of the tabulation go with the various hours of the component sought. These enable one to dispense with the labor involved in copying into the various forms. A few years ago a set of movable scales or strips was devised upon which the hourly heights are copied once for all summations. Several machines have been devised or constructed for facilitating the work of analysis, but they have not yet come into actual use.

Through the 24 partial sums or means finally obtained for a given component (and its harmonics) imagine a curve to be drawn. It may be represented by a Fourier series whose coefficients and initial phases can be found without difficulty. Then by taking the initial phases from the proper astronomical arguments for that time, the required epochs will be obtained.

13. *Prediction of Tides.*— At most ports the time of tide can be roughly predicted by adding to the time of the moon's transit, upper or lower, the average value of the lunitidal interval or "establishment" for the port. Where the diurnal wave is not large, the height of high water above mean sea-level is roughly equal to half of the mean range of tide; the low water is as much below this plane or datum.

Where great refinement is desired, the process just referred to involves much labor, and can best be carried out after a tolerably complete harmonic analysis has been made. This done we have only to add together a series of cosine terms for obtaining the height of the surface of the sea at any given time. But the number of these terms is so great that such a computation would soon become laborious, since it must be made for many assumed times in each day's predictions. Several predicting instruments have been designed or constructed. Generally speaking, the object of such an instrument or machine is to produce simple harmonic motions of suitable periods, phase, and amplitude and to combine the results into one compound wave, or perhaps into two compound waves. The simplest form may be described thus: Upon one or more shafts, driven by hand or by clockwork, are fixed a number of wheels which mesh into other wheels, causing the latter (or wheels moved by them) to revolve with angular velocities having given ratios to the angular velocities of the shafts. These ratios are taken, as nearly as possible, proportional to the speeds of particular tidal components. Rigidly connected to these wheels are cranks carrying pulleys, or pins working in slots and which impart to vertical rods carrying pulleys rectilineal harmonic motions. At one end of the machine a chain or flexible wire is made fast; thence it is laid alternately over and under the pulleys. Near the other end of the chain or wire is attached a marking point which, when moved transversely to the line of motion of the paper roll, traces the tidal curve. It is evident that the machine continually sums a series of cosine terms.

If the instrument include a set of cranks at right angles to those giving the tide curve, together with pulleys and a summation chain or wire, the movement of a point on the chain (taking the place of the tracing point) across a fixed line or mark, corresponding to mean sea-level, will show the time when a high or low water occurs.

The original and simplest form of instrument is that due to Kelvin. The one designed by Ferrel is somewhat complicated, inasmuch as it separates out the principal lunar component. It is now in use in the office of the United States Coast and Geodetic Survey. Its chief advantage consists in indicating upon its face the times and heights of the tides. The office is now constructing a machine which besides tracing a curve, as does Kelvin's, will indicate upon its face the times and heights of the tides,— the times becoming known through the additional mechanism just described.

Bibliography.— Newton, 'Principia,' Bk. I., Prop. 66; Bk. III., Props. 24, 36, and 67; Laplace, 'Traité de Mécanique Céleste,' Bks. IV. and XIII.; Sir John W. Lubbock, Rev. Wm. Whewell, and others in the 'Philosophical Transactions' since 1830; Airy, 'Tides and Waves' (Enc. Met.); Thomson and Tait, 'Natural Philosophy,' 2d ed., §§ 804–848 and Appendix B; Ferrel, 'Tidal Researches' (U. S. Coast Survey); Lamb, 'Hydrodynamics'; Darwin, 'The Tides and Kindred Phenomena in the Solar System'; U. S. Coast and Geodetic Survey Reports; Appendixes by A. D. Bache, Chas. A. Schott, Henry Mitchell, Wm. Ferrel, R. A. Harris, and others.

Annual.—Tide Tables issued by the governments of Great Britain, France, Germany, and the United States.

ROLLIN A. HARRIS,
U. S. Coast and Geodetic Survey.

Tide'water, arms of the sea, bays, creeks and rivers where the tide ebbs and flows are public, and all persons may use the same for the purpose of navigation and fishing, unless restrained by law; in such waters the tide must actually ebb and flow. It is the rise and fall of the water, and not the proportion of salt water to fresh that determines whether or not the particular portion of a stream is within tidewater; the same determination applies to small streams as well as large ones. Open sea is the property of all nations; the rights and privileges therein, if any, being restricted to a specified distance from the shore — generally three miles. In the United States the titles to tidewaters and lands are vested in the States abutting thereon, or of its citizens, but are subject, however, to the constitutional rights of the United States. Congress of the United States, under the power to regulate commerce, has the control of all navigable waters, and for such purposes they

are the public property of the nation and subject to legislation; the test of navigability being whether or not the waters form a continued highway over which commerce may be carried on.

Tieck, tēk, Ludwig, German poet and critic: b. Berlin 31 May 1773; d. there 28 April 1853. He studied at the University of Halle, where, as afterward at Göttingen and Erlangen, he devoted himself enthusiastically to the study of history and of ancient and modern literature, Shakespeare more especially attracting his attention. In 1794 he returned to Berlin, where he, with his sister Sophie, contributed a series of tales to the 'Straussfedern' (Ostrich Feathers), a work commenced by Musæus and J. G. Müller. He also published separately his tale 'Abdallah,' and a novel 'William Lovell' (1795). His 'Peter Lebrecht, eine Geschichte ohne Abenteuerlichkeiten' and 'Peter Lebrecht's Volksmärchen' were alike charming for their imaginative power and simplicity, and their rich overflowing humor. In the comedies that followed these 'Blaubart' ('Bluebeard'), 'Der gestiefelte Kater' ('Puss in Boots,' etc.), Tieck made the classical school the object of his satire. Some of his subsequent works, especially 'Franz Sternbald's Wanderungen' (1798) and 'Phantasien über die Kunst' (1799) brought about a coolness between him and Nicolai; but a close friendship grew up between Tieck and Schlegel, and through this association arose what has been denominated "The Romantic School of Germany." In 1799 he removed to Jena, where he gained the friendship of Novalis. About this time he published 'Romantische Dichtungen' (1799–1800). A translation of 'Don Quixote' (1799–1801) far surpassed all former renderings of Cervantes into German. In 1802 he issued, with A. W. von Schlegel, the 'Musenalmanach,' which encountered much opposition, and found also many admirers among susceptible youth. His long-expected 'Kaiser Octavianus,' which contains many beautiful passages, and is the best of his romantic productions, appeared in 1804. In 1810 he went to Ziebingen, where he formed an intimacy with Solger, which exercised a great and beneficial influence on his future life. Tieck now freed himself from the mysticism and extravagance of fancy which characterized almost all his earlier works, his 'Phantasus' (1812–15) being the first sign of his having attained to a healthier tone. In 1817 he made a journey to England, where he collected materials for his 'Shakespeare.' In 1819 he removed to Dresden. Subsequent to this period the writings of Tieck, as exemplified in his 'Tales,' bear the unmistakable stamp of genius. These appeared in various forms, partly in annuals, partly in the 'Novellenkrans' (Garland of Fiction), and were ultimately published in 12 volumes (1853). While in Dresden he took a lively interest in the management of the court theatre, a circumstance to which are attributable his valuable 'Dramaturgische Blätter' (1826). As already mentioned he was an ardent student of Shakespeare. The result of these studies was two volumes entitled 'Das Altenglische Theater' (1811), consisting of translations of the plays sometimes attributed to Shakespeare, although not generally included in his works; two volumes entitled Shakespeare's 'Vorschule' (1823–9); but above all, the continuation of the German translation of Shakespeare commenced by Schlegel. In this work he was assisted by his daughter Dorothea, and Count Wolf of Baudissin. On the accession of Frederick William IV. he was invited to the Prussian court, invested with a considerable pension and the rank of a privy-councillor, and thenceforward, though in very indifferent health, resided alternately in Berlin and Potsdam, and acted as a sort of supervisor of the Prussian stage. Consult: Carlyle, 'Essays,' Vol. I.; and biographies by Köpke (1855); Friesen (1871).

Tiedemann, tē'dĕ-män, Christopher Gustavus, American legal writer: b. Charleston, S. C., 16 July 1857; d. Buffalo, N. Y., 25 Aug. 1903. He was graduated from the College of Charleston in 1876 and from Columbia Law School in 1879 and was professor of law for 10 years in the University of Missouri and six in New York University. From May 1902 he had been dean of the Buffalo Law School. Among his publications are: 'The Law of Real Property' (1883); 'Limitations of Police Power' (1889); 'The Unwritten Constitution of the United States' (1890); 'State and Federal Control of Persons and Property' (1900).

Tiedemann, Diedrich, German philosopher: b. Bremerworde 3 April 1748; d. Marburg 24 Sept. 1803. He was professor of philosophy in the University of Marburg from 1776 and published 'Researches on the Origin of Languages' (1772); 'System of the Stoic Philosophy' (1777); 'The First Philosophers of Greece' (1780); 'Origin of the Magic Arts' (1787); 'Spirit of Speculative Philosophy from Thales to Berkeley' (1790–7), his principal work; 'Theætetus; or, Human Knowledge' (1794).

Tiedge, tēd'gĕ, Christoph August, German poet: b. Gardelegen, Prussia, 14 Dec. 1752; d. Dresden, Saxony, 8 March 1841. He enjoys distinction as the author of 'Urania,' a lyrico-didactic poem (1800), and 'Mirror for Women.' He also wrote: 'Wanderings through Life's Market,' and 'Elegies.' His admirers have been many, and his poetry has sometimes been compared with that of Cowper.

Tiele, tē'lĕ, Cornelis Petrus, Dutch writer on comparative religion: b. Leyden 16 Dec. 1830; d. there 14 Jan. 1902. He was educated at Leyden and Amsterdam, in 1853 became pastor of the Remonstrant congregation at Moordrecht, and in 1856 removed to Rotterdam, where he became closely associated with Albert Réville (q.v.), whose liberalism in theological matters he fully shared. He was director of the Remonstrant theological seminary at Leyden from 1873 till his death, and during 1877–1901 held the professorship of the science of religion in the University of Leyden, a chair specially created for him. In 1896–8 he delivered the Gifford lectures in the University of Edinburgh. He was one of the pioneers in the study of comparative and historical religion, and among his chief works are: 'The Religion of Zoroaster' (1864); 'Comparative History of the Egyptian and Mesopotamian Religions' (1869–72); 'History of Religion in Antiquity' (1892–6; second ed., 1901); 'Western Asia in the Light of the Most Recent Discovery' (1893); 'Elements of the Science of Religion' (1899).

Tie'mannite, native mercuric selenide. It is a gray, metallic mineral of high specific gravity, 8.2 to 8.5; and a hardness of 2.5. It occurs massive with chalcopyrite in the Harz Mountains in Germany, and in choice isometric-tetrahedral crystals at Marysvale, Utah.

Tientsin, tē-ĕn'tsēn', China, a city and treaty port in the province of Chi-li, situated on the Pei-ho River, 47 miles from its mouth in the Gulf of Pe-chi-li, and about 60 miles southeast of Peking. The old city is a square surrounded by walls and ditches, and traversed by broad, straight streets. Two miles to the south lies the European quarter. Tientsin is connected by rail with Peking and with the Manchurian railroad. It is the river port of the capital, although large vessels cannot ascend the river. Its position at the northern terminus of the Grand Imperial Canal, however, makes it one of the principal trade centres of the empire. The total volume of trade amounts to about $42,000,000 annually, of which more than half represents imports from foreign countries. In June 1900, during the Boxer troubles, Tientsin was occupied, after severe fighting, by the allied troops. Pop. estimated at 700,000.

Tiepolo, Giovanni Battista, jō-vän'nē bät-tēs'tä tē-ä'pō-lō ("Il Tiepoletto"), Italian painter: b. San Piero di Castello, near Venice, 5 March 1696; d. Madrid 27 March 1770. He was a pupil of Gregory Lazzarini and followed as closely as he could in the footsteps of Paul Veronese, whose style he reproduced in numerous wall and ceiling pictures. Many churches and palaces of Venice were decorated by his hand. In 1750 he was summoned to Würzburg, where for three years he worked in the archbishop's palace on the wall paintings in fresco 'Olympus and the Four Continents'; and 'Life of Frederick Barbarossa.' In 1755 he returned to Venice as director of the Art Academy. He was the last great master of the Venetian school. His coloring was superb, and his designs spiritual and expressive even when the drawing was incorrect. Consult: Molmenti, 'Il Capaccio e il Tiepolo' (1885).

Tier'nan, Frances Fisher ("Christian Reid"), American novelist: b. Salisbury, N. C. Among her many works are: 'Valerie Aylmer' (1870); 'Morton House' (1871); 'Nina's Atonement' (1873); 'A Daughter of Bohemia' (1873); 'A Question of Honor' (1875); 'The Land of the Sky,' a volume of travel (1875); 'Bonny Kate' (1878); 'Hearts of Steel' (1882); 'Miss Churchill' (1887); 'Philip's Restitution' (1888).

Tierra del Fuego, tē-ĕr'rä dĕl fwā'gō, an archipelago at the extreme south of South America, separated from the mainland by the Straits of Magellan which form its boundary on the north and northwest, while the Atlantic Ocean bounds it on the east and the Pacific Ocean on the southwest; total area about 19,299 square miles. Politically, it is divided into two parts, each of which will be briefly described. (1) The western part, the area of which is 11,000 square miles, belongs to Chile, and is included in the extensive Chilean Territory of Magallanes, whose capital, the little town of Punta Arenas, stands on the western (mainland) shore of the strait, and is a port of call for steamships of some European and Australian lines (Hamburg to Callao, etc.). The lands belong to the state; in 1901 it was said that 80 square miles had been leased to fur traders, wood-cutters, cattlemen, etc. (2) The eastern part, area 8,299 square miles and population about 1,000 whites and several thousand Indians, belongs to Argentina and forms a territory of that republic, its capital being Ushuaia. Of this region about 1,000,000 acres have passed into private ownership, and only a small proportion is rented. In the north there are fertile valleys, and roads connecting the villages lead through Chilean territory to ports on the southern coast of the Straits of Magellan. The interior is mountainous or hilly, but well adapted to stock-raising. "The climate of this region," it is said, "though cold, is not severe, inasmuch as the mean temperature, maximum and minimum, as taken during several years, is + 5° C. and — 10° C., respectively. Calm days are frequent in winter. Rain increases in the autumn, and in the summer dry winds from the southwest and west prevail, and occasionally are of terrific force." (Compare 'Argentine Republic: a Geographical Sketch,' issued by the International Bureau of American Republics, Washington, 1903.) There are no navigable rivers, but many streams of moderate size, and a number of lagoons. The oldest, and in some respects still the most interesting, description of the region of the famous strait (of which both shores are now held by Chile) is that one written by Anthony Pigafetta, who accompanied Magellan and told of what they saw in October 1520, mentioning the characteristic storms, the "very great and high mountains covered with snow" surrounding the strait, and finally saying: "In it we found at every half league a good port and place for anchoring, good waters, wood all of cedar, and fish like sardines, missiglioni, and a very sweet herb named appio (celery). There is also some of the same kind which is bitter. This herb grows near the springs, and from not finding anything else we ate of it for several days. I think that there is not in the world a more beautiful country or a better strait than this one." Pigafetta's sketch map of Magellan's Straits proves that he regarded Tierra del Fuego as a great southern continent stretching toward the antarctic pole. Compare Lord Stanley of Alderley, 'The First Voyage Round the World,' printed for the Hakluyt Society.

Marrion Wilcox,
Authority on Latin-America.

Tiers-Etat, tē-ār-zā-tä, the third estate, a name early given in France to the free bourgeois, to distinguish them from the nobility and the clergy, the other two estates. The three estates together formed the états-generaux, or States-General, a legislative body which might be compared to the English Parliament. The third estate became famous in the political upheaval in France at the end of the 18th century, when, in the last States-General, it claimed power equal to that of both of the other orders. In 1789 it assumed the name of the National Assembly, and by its subsequent assumption of supreme power consummated the French Revolution. See France, *History*.

Tietjens, tēt'yĕns, or Titiens, Therese Johanna Alexandra, German soprano singer of Hungarian descent: b. Hamburg 17 July

1831; d. London, England, 3 Oct. 1877. She made her début in her native city as Lucrezia in the opera of 'Lucrezia Borgia' in 1849, and her after career was one of great success, as she not only possessed a voice of great power and purity, but was an actress of much ability likewise. She made her home in London after 1858. In 1875 she visited the United States singing in 'Don Giovanni' and other grand operas.

Tif'fany, Charles Comfort, American Protestant Episcopal clergyman: b. Baltimore 1829. He was educated at Dickinson College, Andover Theological Seminary, and the universities of Halle, Heidelberg, and Berlin, and took orders in the Episcopal Church in 1866. He was rector of the Church of the Atonement, New York, 1874–80, and of Zion Church there 1880–90. Since 1893 he has been archdeacon of New York. He has published 'Expression in Church Architecture'; 'Modern Atheism'; 'History of the Protestant Episcopal Church' (1895); 'The Prayer Book and the Christian Life' (1897).

Tiffany, Charles Lewis, American manufacturer: b. Killingly, Conn., 15 Feb. 1812; d. New York 18 Feb. 1902. In 1837 he began his business career in New York, where in partnership with John B. Young he opened a stationer's store, to which was added Chinese and Japanese works of art, and later, French jewelry. In 1848 the firm of Tiffany & Co. began to deal exclusively in jewels, bronzes, and other articles of virtu, and to manufacture gold and silver ware. He was known as the chief diamond merchant in the United States, and established branch houses, also well known, in London and Paris. He was a liberal patron of the fine arts.

Tiffany, Francis, American Unitarian clergyman and author: b. Baltimore 16 Feb. 1827. He was graduated from Harvard in 1847, and after study at the Harvard Divinity School was ordained to the ministry in 1852. He held Unitarian pastorates at Springfield, Mass., 1852–62, and West Newton, Mass., 1865–82, and was at one period professor of English at Antioch College, Yellow Springs, Ohio. He has traveled widely and published 'Life of Dorothea Lynde Dix' (1890); 'Bird Bolts'; 'Life of Charles F. Barnard' (1895); 'This Goodly Frame, the Earth,' a volume of Oriental travel (1895).

Tiffany, Louis Comfort, American artist: b. New York 18 Feb. 1848. He studied his profession in New York and Paris, where he developed remarkable skill as a colorist and designer of decorative forms. He has become famous by his use of the Tiffany fabrile glass, which has revolutionized the art of making stained glass or colored windows. His work has been widely recognized in Europe and he has had a profound influence on the character of modern church and domestic decorative art through his position as president of the Tiffany Glass and Decorating Company.

Tiffanyite, a bluish-white hydrocarbon enclosed in certain Brazilian diamonds and supposed to be the cause of their phosphorescence.

Tiffin, Edward, American physician, preacher, and politician: b. Carlisle, England, 19 June 1776; d. Chillicothe, Ohio, 9 Aug. 1829. About 1786 he went to Charlestown, Va., and in 1789 was graduated in medicine at the University of Pennsylvania. Three years later he became a local preacher in the Methodist Church, likewise studying law and continuing the practice of medicine. About 1797 he removed to Chillicothe, in what was then the Northwest Territory, was elected to the Territorial legislature, and in 1799 was speaker. He was chosen president of the convention which framed the State constitution (1802), and became first governor (1803–7) of Ohio. The town of Tiffin in that State was named for him. He arrested the Burr-Blennerhassett expedition in 1805 (see BLENNERHASSETT, HARMAN; BURR, AARON). He was a United States senator in 1807–9, resigning in the latter year to assume the speakership of the Ohio legislature. He was the first commissioner of the General Land Office (1812), and at the burning of the National Capitol by the British in 1814 saved the papers from destruction. In 1815 he was made surveyor-general of the Northwest Territory, and continued in that office almost until the end of his life.

Tif'fin, Ohio, city, county-seat of Seneca County; on the Sandusky River, and on the Baltimore & O., the Pennsylvania, and the Cleveland, C., C. & St. L. R.R.'s; about 80 miles north by west of Columbus, the State capital, and 40 miles southeast of Toledo. It was settled in 1817 by Erastus Bowe, and incorporated in 1835. In 1836 it was chartered as a city. It is the commercial and industrial centre for a large portion of the county, in which are many fine farms. In the vicinity of Tiffin are deposits of clay and glass-sand. The chief manufacturing establishments of the city are machine shops, glass works, potteries, wagon and carriage works, strawboard works, woolen mills, breweries, shoe factories, iron works, planing mills, emery-wheel works, flour mills, and furniture factory. There are about 5,000 (1904) employees in the manufactories. The principal public buildings are the county courthouse, the municipal buildings, the churches, and schools. There are 16 churches, representing 10 denominations, and Saint Francis Hospital and Home. The educational institutions are Heidelberg University (Reformed), opened in 1850 (nearly 400 students in 1904), Ursuline College, public and parish schools, and two libraries. The four banks have a combined capital of $500,000; the annual business, done through the banks, amounts to over $3,000,000. The government is administered under a board of public safety, board of public service, and council of seven members elected by wards and at large. Pop. (1890) 10,801; (1900) 10,989.

Editor 'Advertiser.'

Tiflis, tĭf'lēs', Russia, the capital of the government of Tiflis in the general government of Caucasia (see TRANSCAUCASIA), situated at the southern base of the Caucasus about midway between the Black and Caspian seas. It is picturesquely built on terraces rising from the valley of the Kur, and surrounded by orchards and vineyards. Some walls and towers of the old fortifications remain, and there are several parks and a botanical garden. Among the numerous churches the most interesting is the cathedral of Zion, dating in part from the 5th century. Other notable buildings are the palace

of the governor-general, the Caucasian museum, and a new theatre. The educational institutions include nearly a dozen high schools besides numerous technical schools, one of the foremost of which is the recently established and finely equipped school of commerce. The chief industries are the manufacture of leather and tobacco. There is also a cotton-mill, and several breweries and distilleries. Commerce has declined somewhat, though the city is connected by rail with both the Black and the Caspian Sea. Pop. (1897) 160,645.

Tiger, the largest and most admirable of the cats (*Felis tigris*). In size and power it surpasses the lion, as it does in beauty, and expresses the highest type of feline structure (see FELIDÆ). The ground color of the body is a bright tawny yellow, bearing black stripes running at right angles with the general axis of the body and limbs. The under parts and inner aspect of the limbs are white, as also are the throat and chest. On these white parts the stripes are lighter, and gradually merge into the white color. The tail is not tufted at its extremity, and is usually of lighter hue than the body, with dark rings. White or albino varieties of the tiger have been found, as also black ones. The maximum length, including the tail, is about 11 feet, and the largest weight about 500 pounds. The tiger attains its full development in India, the Bengal variety being the largest and most typical; but it also occurs in southern Siberia, Turkestan, Persia, Java, Sumatra, China, and Japan, encountering a range of climate from tropical to sub-arctic conditions. In habits these animals are far more active and agile than the lion, and exhibit a large amount of fierce cunning. They generally select the neighborhood of water-courses as their habitat, and spring upon the animals that approach to drink, then drag them to a more retired spot to be devoured. The march of the animal through the thick brushwood of the jungles in which it lives is noiseless and stealthy, and it appears rather to avoid than to court danger, although, when brought to bay, no animal presents a fiercer front than the tiger. Where deer, antelopes, and wild hogs are abundant, domestic animals are comparatively safe, but otherwise the tiger is ready enough to prey on the latter. When pressed by hunger or enfeebled by age and incapable of dealing with larger prey, like buffalos, the tiger prowls around villages, and, having once tasted human flesh, becomes a confirmed cattle-lifter and man-eater, sometimes causing the temporary abandonment of a large district by the terror-stricken inhabitants; and in several historic instances districts of country in southern India, Indo-China, and the adjacent islands, have been deserted permanently because so infested with tigers harbored by neighboring swamps and jungles. The number of persons killed by tigers each year in India averages about 930, mostly in Bengal, Madras, Central Provinces, Assam, and Burma. About 32,000 head of cattle are also killed annually in India by tigers.

The natives destroy tigers by traps, pitfalls, spring-guns, and poisoned arrows, but the orthodox method of keeping down their numbers as pursued by Europeans is to employ natives to beat the bush while the game, when started, is shot by the sportsmen seated on elephants. The sport is exciting, but dangerous; for a wounded tiger has been known to spring on an elephant and to inflict serious wounds on the driver and occupants of the howdah, before it could be despatched. A safer and more common method is to tether a live goat, or otherwise set a bait in a place where a tiger may be expected, then erect a platform on poles or in a tree near by, and await the animal's approach on a night when moon or stars shed light enough to enable the watcher to shoot his prey.

These great cats have always been kept in captivity by Oriental rulers, and now and then have been completely tamed. They have been a feature of every menagerie and animal trainer's show since such collections began to be formed, and as they readily breed in captivity the supply will easily be maintained. Consult Blanford, 'Mammals of India' (London, 1888), and books on sport and travel in India and the East Indies.

Tiger-beetle, a beetle of the family *Cicindelidæ,* in which the head is wider than the thorax, and the terminal hook of the maxillary jaws is jointed at its base. This insect is swift and active, and preys upon other insects.

Tiger-cat, a name of not very definite signification, sometimes given to some of those animals of the family *Felidæ* which are of middling size, and somewhat resemble the tiger in their form or markings, such as the chati, margay, serval, etc. (q.v.). In America the ocelot (q.v.) is most often meant. The marbled tiger-cat is a small beautifully variegated species (*Felis marmorata*) of the eastern Himalayan region.

Tiger-eye, a semi-precious, chatoyant stone, of blue, yellow, or brown color, which exhibits a charming change of colors when revolved. It is a silicious pseudomorph after crocidolite. The original mineral is changed by infiltration of silica and when accompanied by the oxidation of its iron its blue color is altered to yellow or brown. It is extensively cut into watch charms, cuff buttons, and many fancy articles which are largely sold at many tourist resorts, often, though fraudulently, as of local origin, the mineral being found only in Griqualand, South Africa. See CROCIDOLITE.

Tiger-flower, a Mexican plant (*Tigridia pavonia*) of the iris family, frequently cultivated for the brilliance and oddity of its flowers. These are solitary, terminal, and cup-shaped, in the centre, but have a widespreading limb, formed by three obovate clawed segments of the perianth, which are the largest, and are brilliant red at the outer edge, shading to yellow, spotted with reds and purples at the base. The three inner segments are fiddle-shaped. The flowers are fugacious, lasting only a day, but there is a long succession of them. There are many varieties of these Tigridias, in which the hues of the corollas range through various shades of yellow to white. The stem is about a foot high, slightly zigzag and branched; and it bears a few alternate distant leaves, the greater number of the leaves being radical and sword-shaped. The tunicated corms need to be lifted into a dry place out of reach of frost during the winter, as they are not hardy in the northern United States. Tigridias are propagated by seeds or offsets. There are other

species of the genus, which are not so handsome or conspicuous as *T. pavonia;* some of them have bluish flowers.

Tiger Lake. See NAHUEL-HUAPI.

Tiger Lily. See LILY.

Tiger-moth, one of the large moths of the genus *Arctia,* the caterpillars of which are known as "woolly bears" (q.v.).

Tiger or Zebra Shark, a shark (*Stegostoma tigrinum*) common in the Indian Ocean. The full-grown fish, from 10 to 15 feet long, frequent the open sea. The color is a yellowish-brown, with black or dark-brown transverse bands or spots.

Tiger-snake, a large blackish, yellow marked elapine poisonous serpent (*Notechis scalatus*), widely disseminated in Australia and Tasmania, and very numerous.

Tighe, tī, Mary Blackford, Irish poet: b. Dublin 1773; d. Woodstock County, Kilkenny, 24 March 1810. She was married to her cousin, Henry Tighe, in 1793. Though her poem, 'Psyche, or the Legend of Love,' was privately printed (1805), it was only after her death that her complete writings were published. The first edition was in 1811, and they have been several times reprinted. The 'Psyche' is written in the Spenserian stanza, and is founded on the story of Cupid and Psyche as narrated in 'The Golden Ass' of Apuleius. Her other poems are chiefly of a religious cast. It is probably as the subject of Moore's lyric, "I saw thy form in youthful pride," and of Mrs. Hemans' 'Grave of a Poetess,' that Mrs. Tighe will be longest remembered.

Tigranes (tīg-rā'nēz) **I.,** king of Armenia, 96 to 55 A.D. A descendant of Artaxias, the founder of the Armenian kingdom, he brought under his rule large accessions of territory in Syria and Mesopotamia, and in 83 B.C. had acquired most of the provinces of Syria from the Euphrates to the sea. By his marriage with the daughter of Mithridates, king of Pontus, he formed an alliance with that monarch disastrous to the smaller kingdoms of Asia Minor. With the aid of Mithridates, he invaded Cappadocia in 68 and completely subjugated its inhabitants, 300,000 of whom he conveyed as prisoners of war to his new capital, Tigranocerta. These possessions were wrested from him by the Roman general Lucullus, but were nearly all recovered by Tigranes, only to be lost again to Pompey in 66. In the final defeat of Tigranes, Pompey was aided by the rebel son of the Armenian king, who claimed the provinces of Gordyene and Sophene for himself. Tigranes was able to retain only Armenia proper, for which he was obliged to pay Pompey an enormous sum, and to subsidize the entire Roman troops under him. Tigranes was succeeded by his second son, Artavastes.

Tigris, tī'grĭs, Asia, an important river which rises near the Euphrates (q.v.) from two sources. The western and chief branch rises near Kharput, and under the name of Dejleh or Shatt, flows southeast. After passing Diarbekir it receives the eastern branch, flows past Mosul and Bagdad, and joins the Euphrates at Kurna; together they form the Shatel-Arab, and thus enter the Persian Gulf. The stream waters the ancient Nineveh, and separates Assyria from Mesopotamia, on its way to Bagdad. It is only navigable for small boats and its entire length is 1,150 miles. Keleks, or large rafts, supported by inflated skins, are much in use for the transportation of freight. The chief tributaries are the Greater and Lesser Zab and the Diyala. The Biblical name of the river is Hiddekel.

Til'den, Douglas, American sculptor: b. Chico, Butte County, Cal., 1 May 1860. He lost his hearing in early life and was graduated from the State Institution for the Deaf in Berkeley, Cal. (1879). Taking up the study of sculpture in 1893 he was appointed a member of the jury on sculpture at the World's Columbian Exposition in Chicago. He was elected a member of the National Sculpture Society, the New York Art Club, the San Francisco Art Association, etc., and professor of sculpture at the Mark Hopkins Art Institute. His works include 'Base-Ball Player'; 'Tired Boxer'; 'Indian Bear Hunt'; 'Football Players'; etc.

Tilden, Samuel Jones, American lawyer and statesman: b. New Lebanon, N. Y., 9 Feb. 1814; d. Greystone on the Hudson, near Yonkers, N. Y., 4 Aug. 1886. He was educated at Yale and at New York University, being graduated from the latter in 1837. He then studied law and was admitted to the bar in 1841. He attained the first rank in his profession, being particularly successful in reorganizing corporations involved in litigation, and amassing one of the largest fortunes ever gained in the practice of law. While a student in college, he had taken an active part in politics, writing and speaking in favor of Martin Van Buren's policy; in 1845 was elected to the New York State legislature and was a member of a special committee to consider the settlement of anti-rent troubles, his report on the subject forming the basis of subsequent legislation. In 1846 he was a member of the State constitutional convention, and in 1848 was one of the delegates of the Free Soil faction of the Democratic party to the National Convention, but his political activity then slackened until after the Civil War. During the war, however, he was several times consulted by President Lincoln; he believed that the war, once begun, must be carried through by the Federal government, but opposed some acts of the administration as unconstitutional. In 1866 he was made chairman of the Democratic State committee, and in 1867 was a member of the State constitutional convention. As chairman of the State committee he took a leading part in the overthrow of the Tweed Ring, opposing their delegates in the State conventions, and being active in collecting evidence against their leaders and bringing them to prosecution; in 1872, having been elected to the State legislature, he was the leader in the impeachment of two of the Tweed judges. (See TAMMANY SOCIETY; TWEED, W. M.) In 1873 he resigned as chairman of the State committee; but in 1874 was nominated and elected governor of New York. His administration was notable for his successful exposure of the "canal ring," an association made up of persons who obtained contracts for canal work which they never fulfilled, but for which they were paid, and their political supporters. Gov. Tilden employed a skilled engineer to examine their

work, and then surprised the legislature by a wholly unexpected special message setting forth in detail the fraudulent methods of the "ring." This served as a direct appeal to the people; and so aroused public opinion that the legislature was forced to authorize the governor to appoint a canal commission. The reports of this commission resulted in a marked diminution in the appropriation for canals and the indictment of several officials for defrauding the State. In 1876 Tilden was the Democratic nominee for President of the United States, and received the largest popular vote, but lacked one electoral vote necessary for his election. As the electoral votes from several States were contested on account of alleged fraud, the matter was referred to a special Electoral Commission, which decided in favor of the Republican candidate, Rutherford B. Hayes. (See ELECTORAL COMMISSION.) Popular excitement had run high, and many Democrats still claimed Tilden's election, but he urged his supporters quietly to accept the decision of the commission. In 1880 and 1884, his party again wished to nominate him for the Presidency, but each time he declined the nomination. He bequeathed the most of his fortune to establish a public library in New York; but the will was contested by the heirs, and only a part of the bequest came into the city's possession. (See TILDEN FOUNDATION.) Consult: Cook, 'Life of Samuel J. Tilden'; Bigelow, 'Life of Samuel J. Tilden'; and his collected 'Writings,' edited by Bigelow.

Tilden Foundation, The, one of the integral components of the New York Public Library Fund. By the will of Samuel J. Tilden (q.v.) the bulk of his property was left for the establishment of the Tilden Trust, to found a free public library and reading room in New York. This will was contested in a long suit in the courts and was broken in 1891, the property being decreed to the heirs. Mrs. William B. Hazard, one of the latter, was entitled by this decision to half of the estate, but she relinquished about $2,000,000 of her portion in order that Tilden's wishes might be carried out to some extent. In 1895 an agreement was reached whereby the trustees of the Tilden Trust Fund, the Astor Library, and the Lenox Library agreed to unite their properties, forming a single "New York Public Library — Astor, Lenox, and Tilden Foundations." The city of New York subsequently agreed to erect on the site of the old reservoir, in Bryant Park, 40th to 42d Streets on Fifth Avenue, a handsome and spacious structure for these great libraries. The work, now in course of construction, was begun in June 1899. See also LIBRARIES.

Tile'fish, a large oceanic fish (*Lophalatilus chamelconticeps*), allied to the cods, and belonging to the family *Malacanthidæ*, represented by the blanquilla and other well-known foodfishes of the Pacific coast. It weighs from 10 to 40 pounds, and is big-headed and brilliantly colored, with a curious triangular fatty protuberance on the top of the head in advance of the long low dorsal fin. Its flesh is excellent, and it is caught in the same manner as are cod. The curious story of this fish is thus sketched by Lucas:

"This fish, belonging to a tropical family having its headquarters in the Gulf of Mexico, was discovered in 1879 in moderately deep water to the southward of Massachusetts and on the edge of the Gulf Stream, where it was taken in considerable numbers. In the spring of 1882 vessels arriving at New York reported having passed through great numbers of dead and dying fishes, the water being thickly dotted with them for miles. From samples brought in, it was found that the majority of these were tilefish, while from the reports of various vessels it was shown that the area covered by dead fish amounted to somewhere between 5,000 and 7,500 square miles, and the total number of dead was estimated at not far from a billion. This enormous and widespread destruction is believed to have been caused by an unwonted duration of northerly and easterly winds, which drove the cold arctic current inshore and southward, chilling the warm belt in which the tilefish resided and killing all in that locality. It was thought possible that the entire race might have been destroyed, but, while none were taken for many years, in 1899 and 1900 a number were caught, showing that the species was beginning to reoccupy the waters from which it had been driven years before."

Consult: Lucas, 'Animals of the Past' (New York 1902); and 'Reports' and 'Bulletins' of the United States Fish Commission, especially for 1884 and 1899.

Tiles differ from bricks only in that they are thinner and are usually made of finer material. The line of distinction between the two is not distinct and a large thick tile may be considered a brick. While tiles are used in an endless variety of ways by the artisans and masons of to-day, as regards their chief use they may be considered as of three kinds: tiles for draining; tiles for interiors, floors, and walls; and tiles for roofing. Drainage tiles are commonly made of a coarse, rough clay, glazed on inside or outside, or both, according to their uses, and tubular or semi-tubular in shape, of sizes ranging from a few inches to many feet in diameter. Each tile has at one end an extended rim which overlaps the small end of the tile next to it, thus forming a continuous pipe. Roofing tiles take the form either of flat shingle or slate-like slabs or of pantiles. A section through a pantile shows a horizontal-like curve, one side of the tile being concave and the other convex — the latter curve fitting over the concave curve of the next tile, and so on. In this manner there is no slam left open to the weather. The same principle is often applied to the flat tiles and to ridge tiles, which bear on one edge a semicircular convex lip, and on the other a concave one. Ridge tiles are made in angles to fit and cap the ridge-pole of a roof, to turn corners, and to ornament projections. Roof tiles are glazed or dull, according to the maker's fancy, and are used in varieties of colors. Modern taste seems to prefer either highly glazed saffron or terra-cotta pantiles, or else dark, dull flat ones. But during the Renaissance, and until recent years, highly colored glazed roof tiles either in the flat or corrugated style, were in large demand throughout southern and central Europe. Fine examples of decorative roofs are preserved from the Middle Ages, a notable instance being the

roof of St. Stephen's Cathedral in Vienna. Such tiles are often enameled and are thus rendered waterproof.

Interior tiles are made in great varieties of shapes and sizes, colors and materials, ranging from fine brick-clay tiles to those of enameled and painted porcelain. They are used for pavements, flooring, and revetments to walls. Old houses in the south of Europe were commonly paved with red brick-tiles baked hard and sometimes glazed. The method of decoration usually employed was to inlay clays of different colors in the bodies of the tiles, producing designs often of great beauty. Enameled tiles were used in the 15th and 16th centuries for the pavings of interiors of importance, such as chapels, chambers of honor, etc. These thin, enameled tiles broke easily and only a few examples are to-day preserved in the cathedrals and castles of France and Italy. The use of tiles for wall revetments and for dados was not general during these periods but has grown in recent years. Modern wall tiles are usually painted or glazed and are of various fine clays, not infrequently of porcelain. Large wall spaces are covered with painted tiles in pictorial or decorative composition, the work of Théodore Deck affording some fine examples. Tiles with slightly raised figures are also used, the style having been borrowed from the Persians who are masters of their manufacture. A recent effective use of colored clay tiles may be seen in the underground railway stations in New York, where especially pleasing effects have been inexpensively produced by the judicious selection and blending of colors. Modern usage does not follow the example of the Middle Ages in the employment of carved and leaded marble tiles. In these latter the variously shaped slabs of stone were incised with intricate and elaborate designs and the incisions filled with lead or colored compositions and sometimes with fine mosaic work.

Consult W. A. Church, 'Patterns of Inlaid Tiles,' etc. (1845); H. Herdtle, 'Vorlagen für das polychrome Dachornament' (1885); Owen Jones, 'Designs in Mosaic and Tessellated Pavements,' etc. (1842); Henri Monceaux, 'Les carrelages historiés du moyen-âge et de la renaissance,' etc. (1887); Henry Wallis, 'Italian Ceramic Art,' etc. (1902); and the papers of H. R. Ricardo on 'Architect's Use of Enameled Tiles' (in 'The Architectural Review' for 1902, Vol. XI.).

Tilghman, tĭl'man, **Mathew,** American patriot: b. Queen Anne's County, Md., 17 Feb. 1718; d. Talbot County, Md., 4 May 1790. He was a member of the Maryland assembly in 1751, and as a magistrate and prominent member of Talbot County was a member of the committee which drew up the Maryland protest to the Stamp Act. In 1774 he was made president of the Provincial Congress or Convention which controlled the affairs of the colony until its statehood, and in 1777 represented Talbot County in the Provincial Senate. He was a delegate to the Continental Congress 1775–7, and was throughout the entire pre-Revolutionary period a staunch defender of the cause of independence and an able advocate of civil rights.

Tilghman, Tench, American soldier, nephew of M. Tilghman (q.v.): b. Talbot County, Md., 25 Dec. 1744; d. Baltimore, Md., 18 April 1786. His career as a merchant in Philadelphia was interrupted by the Revolution. He joined the Continental army at the outbreak of the war, and was one of the officers sent to confer with the Six Nations. In 1776 he was appointed aide-de-camp to Washington, in which position he continued to the close of the war, and in this capacity was entrusted with the bearing of the surrender of Cornwallis to Congress on 19 Oct. 1777. The war being ended, he settled in Baltimore, where he again took up a mercantile life.

Tilia'ceæ, an order of trees, the lindens, with some shrubs and a few herbs, mostly indigenous to the tropics, especially in South America and Asia. A few are natives of the north temperate zone. The chief genus is *Tilia*, characterized by alternate, simple leaves; solitary or variously grouped axillary flowers with four or five sepals and petals, numerous stamens with two-celled anthers; and several-celled capsules or drupes. One of the most striking peculiarities of the order is the abundance of mucilaginous substances in various parts of the plants, particularly in the young twigs, inner bark, and buds. On this account several species are valued for stock-food. Many of the species are noted for their tough fibrous bast, often used for making cordage, bagging, and even fine fabrics, as in the case of jute. Some species furnish edible fruits, for instance, *Grewia denticulata*, which yields large quantities of acid drupes about half an inch in diameter. The linden and the basswood are particularly useful trees in the cool temperate zone, where they are employed for timber, street and park planting, and as forage for bees, their abundant nectar furnishing one of the finest grades of honey. See Linden; Corchorus; Fibre; Jute; Lime; Tritoma.

Till, a heterogeneous mixture of clay, boulders, sand, gravel, and rock flour, blue when fresh, but ochre-colored when oxidized under the atmosphere, and covering generally the surface of the rocks in the glaciated region. It represents the ground moraine of the great Pleistocene ice sheet, which finally slid over it and compacted it more or less firmly. It sometimes rises locally in compressed dome-shaped eminences known as drumlins. See Glacial Period.

Tillage. See Agriculture.

Til'lett, Wilbur Fisk, American Methodist theologian: b. Henderson, N. C., 25 Aug. 1854. He was graduated from Randolph-Macon College in 1877 and from Princeton Theological Seminary in 1880. He held a pastorate at Danville, Va., 1880–2, and has been professor of systematic theology at Vanderbilt University since 1884 and vice-chancellor there from 1886. He has published 'Hymn Studies' (1889); 'Discussions in Theology' (1890); 'Personal Salvation' (1902); 'The Doctrines of Methodism' (1903).

Tilleulenspiegel, tĭl'oi"lĕn-spē-gĕl, a series of stories collected and first published in Low Dutch, in the year 1483. The hero of them, whose first name was Till or Thyl, was a traveling buffoon, who, besides presenting farces and the like, was a practical joker. The name

of Eulenspiegel probably comes from a picture or coat of arms which he left after perpetrating a joke, which consisted of an owl (Eule) and a mirror (Spiegel), and which is to-day shown, on what is said to be his gravestone, in Luneburg. These stories have been translated into all the European languages. Consult Simrock, 'Ein kurzweilig Lesen von Till Eulenspiegel nach den ältesten Quellen' (1878).

Till'man, Benjamin Ryan, American politician: b. Edgefield County, S. C., 11 Aug. 1847. He was educated at Bethany Academy, but studies were interrupted by the Civil War, in which he took part as a Confederate officer until a serious illness compelled his retirement. At the close of the war he rose to prominence in the political activities of his State, and during the years of reconstruction was actively interested in its educational advancement. He enlisted the agricultural interests, and in 1890 and again in 1892, being supported by the "Farmers' Alliance," he was elected governor of South Carolina. In 1895, again in 1901, he was elected to the United States Senate. In March 1902 Senator Tillman assaulted his colleague, Senator McLaurin, in the Senate chamber, for which act he was censured and suspended.

Tillman, Samuel Escue, American soldier and author: b. near Shelbyville, Tenn., 2 Oct. 1847. He was graduated from West Point in 1869, and assigned to frontier duty. In the following year he was called to West Point as assistant professor of chemistry, and was later appointed professor of mineralogy and geology. He continued to teach in the Military Academy for many years. In 1874–5 he served as a member of the United States expedition to Tasmania to witness the transit of Venus. He is the author of 'Essential Principles of Chemistry' (1884); 'Elementary Mineralogy' (1894); 'Important Minerals and Rocks' (1900); and other text-books.

Tillodon'tia, a group of extinct mammals, chiefly of the North American Eocene rocks. They were large plantigrade, five-toed land animals, whose skeleton presents characters intermediate between those of *Carnivora* and *Rodentia.* The brain is small and slightly furrowed. The dentition was complete, and marked by large, rodent-like incisors. A prominent genus was *Tillotherium.*

Tillotson, tĭl'ŏt-sŏn, **John,** English prelate, archbishop of Canterbury: b. Halifax 1630; d. 1694. His father, a strict Calvinist, brought up his son in the same principles. He was graduated at Cambridge and elected a fellow of Clare Hall in 1651. In 1666 he was made king's chaplain, and presented to a prebend of Canterbury. When Charles II., in 1672, issued a declaration for liberty of conscience, for the purpose of favoring the Roman Catholics, he preached strongly against it, but was, nevertheless, advanced to the deanery of Canterbury, and three years after (1675) presented to a prebend in Saint Paul's. On the accomplishment of the revolution he was taken into favor by King William, and in 1689 he was appointed dean of Saint Paul's. On the suspension of Archbishop Sancroft as a nonjuror he was appointed to exercise the archiepiscopal jurisdiction, and in 1691 accepted the archbishopric itself. He had previously formed an abortive scheme for the comprehension of the Presbyterians within the Church, and had also failed in another design for forming a new book of homilies. When, therefore, he accepted the primacy, a large party assailed him with great animosity. He bore these attacks in silence, and even prevented some prosecutions for libel against him, directed by the crown. He was also charged with Socinianism; in answer to which he republished four of his sermons on the 'Incarnation and Divinity of Our Saviour.' The only class to whom he did not show a mild and tolerant spirit was the Roman Catholics, toward whom he had a strong aversion. Tillotson's sermons were for half a century the most popular of that class of compositions in the English language, but have since fallen into neglect and even disesteem. In other respects than that of style they are generally commended for benignity of spirit rather than depth or richness of thought.

Tilly, tĭl'ĭ (Fr. tē-yē) **Johann Tserklaes,** COUNT OF, Bavarian commander: b. Castle Tilly, near Gembloux, Belgium, February 1559; d. Ingolstadt, Bavaria, 30 April 1632. At first a soldier of fortune in the service of Spain, and later in that of Austria, he attached himself permanently to the Bavarian army, and under the banner of its king, the head of the Catholic League, entered upon the Thirty Years' war. His first signal victory was that of White Mountain, 6 Nov. 1620, when he defeated the Protestants in Bohemia. In 1622 he compelled Christian of Denmark, who had joined the Protestant forces in Saxony, to retire into his own domain. In 1630 he was made commander of the Imperial army and in 1631 won the famous battle of Magdeburg against Gustavus Augustus of Sweden and the Saxon Protestants. In the following September the Bavarian troops were, however, completely routed by the Swedes at Breitenfeld, and in the engagement upon the river Lech, Tilly, who had been victorious in 36 battles in the religious wars of Germany, was mortally wounded.

Til'sit, Germany, a town in East Prussia, at the confluence of the Memel or Niemen, and the Tilse, 65 miles northeast of Königsberg. Its principal buildings are the gymnasium, real-school, churches, theatre, barracks, castle ruins, and benevolent institutions. The chief manufactures are iron castings, machinery, paper, soap, glass, oils, snuff, chemicals, cloth, cheese, and leather. The eel and salmon fisheries are important, as well as the large stock-markets. At Tilsit the famous peace, ending the Russian-French-Prussian war was concluded (1807), by various concessions, changes of territorial government, Napoleon largely dictating the terms. Among other conditions Russia agreed to make peace with the Porte, by Napoleon's mediation, and his brothers were made respectively kings of Westphalia, Naples, and Holland.

Til'ton, Theodore, American journalist: b. New York 2 Oct. 1835. He was graduated from the College of the City of New York in 1855 and began his career as a journalist on the New York 'Observer.' In 1856 he became attached to the editorial staff of the 'Independent,' and in 1863 became its editor-in-chief. In 1871 he became an editor of the Brooklyn 'Union,' but shortly after established a weekly periodical he called the 'Golden Age,' but which he discon-

tinued in 1874. In 1874 he caused great consternation in Plymouth Church, Brooklyn, and a sensation throughout the country, by accusing the Rev. Henry Ward Beecher of criminal intimacy with his wife. The trial, which resulted in the disagreement of the jury, covered a period of six months. Since 1883 he has lived abroad. He is the author of several volumes of verse, 'The Sexton's Tale and Other Poems' (1867); 'Suabian Stories' (1882); 'Thou and I' (1880); etc.; a novel, entitled 'Tempest-Tossed' (1873); and other works.

Timber Lands, United States. The greatest of the white pine timber belts once covered the northerly half of each of the States of Michigan, Wisconsin and Minnesota, ending at the margin of the Red River Valley, in the northwestern part of the latter State. This timber consisted mainly of white pine interspersed more or less with Norway pine, and in Wisconsin, in particular, mixed with quite extensive amounts of hardwood timber. There was also a large belt of hardwood running along the south of this in Michigan and Wisconsin, with quite an extensive tract in Minnesota. The white pine is the most valuable of all timber for lumber purposes, excepting the sugar and white pine of California and southern Oregon. Being the most elastic, soft, smooth, and permanent in holding its shape, places it in the first rank as inside finishing, and in the manufacture of doors, which constitutes one of the largest factors in the construction of buildings. The Norway pine is strong, elastic, and not liable to warp, close grained and harder, but does not splinter. It is useful for flooring, dimension timber, and common boards, and somewhat in use for inside finish.

Lumbering began in Michigan about 1856 on a small, unprofitable scale. In the course of a few years it was started in the lower part of the Wisconsin pineries, and in about 1850 in Minnesota. During these earlier years the lumber trade was very unsatisfactory, as the early settlers possessed but small means to use in the purchase of pine lumber. Instead they used hardwoods that were so extensively spread over Ohio, Indiana, Illinois, and Michigan, and to some extent in Wisconsin and Minnesota. After the close of the war, the railways opened up the trade of the extensive prairies of Illinois and Iowa, and later reached out into Kansas, Nebraska, and the Dakotas. Immense quantities of logs and lumber also reached the markets by way of the great river highways. This made the manufacture of white pine profitable, and the production reached enormous proportions from 1870 to the end of the century. Within recent years, this output has been decreasing, particularly in Michigan, as the forests have been exhausted by the enormous drain made upon them. There has been taken from the State of Michigan probably 135 billions, largely white pine. That from Wisconsin will probably reach the amount of 85 billions; from Minnesota, 45 billions. This would make a continuous train of cars of lumber in the usual sized carloads of the present time, reaching around the world more than five times. The vast hardwood belt which covered the great portion of the country between the Mississippi River and the Atlantic Ocean, excepting the northerly two thirds part of Illinois, has been cut away and in large part burned in log heaps as an incumbrance to the earth, to be destroyed in order to reach the soil. Some of the best portions of the most suitable trees were cut into logs and sawed into lumber in the numberless small saw-mills which were located thickly through the entire hardwood belt. Large portions of the timber were cut into logs to be split into rails for fences, which constituted the universal method of enclosing the fields, and for which purpose an enormous quantity of timber was used. The farm houses, and most of those in the villages, together with the barns, stables, and other buildings, were constructed of logs notched together, one on top of the other, with the openings sawed out. This hardwood was cut away as rapidly as could be done, and the whole of this vast forest has been swept away excepting only small patches here and there, left as wood lots for home use. The increasing demand for lumber reached in the last census year, 1900, the enormous proportions of 350 feet of pine and other coniferous woods and 100 feet of hardwood, making 450 feet per capita of the inhabitants, as against 80 feet per capita in Europe. The pine timber has been removed more rapidly than it could otherwise have been, were it not that the county officers sought by excessive taxation to gather larger revenues from the timber while it was being cut and in this hastened the destruction of the forests. These people, in addition to their desire to profit by such tax payments personally, felt that when the timber was cut, the land would still be of value for farming purposes, although not as good soil as the hardwood lands. Yet a considerable part of it will come under cultivation in the course of time, and is now to some extent being settled up. The lack of wisdom on the part of the State and county authorities in this respect is very apparent now, as the public interests have not been as well conserved as they would have been under a more considerate policy. These forests now, excepting some portion remaining in Minnesota, a small amount in Wisconsin and a remnant in the northwestern part of Michigan, are nearly exhausted, and the remainder will be cut within a comparatively few years. The market formerly supplied from this timber must now obtain its stock from the southern timber belt, from Canada and the Pacific coast. In the comparatively near future the lumber consumption per capita must be decreased or the available supply will be consumed within the next 30 years. The result would be a lumber famine, and in consequence, an excessive cost in building homes, and for all uses for which lumber is essential or very desirable.

Moving westward, the next source of supply is a comparatively small amount of pine timber in Montana and a larger one in Idaho, growing on the side slopes of the Rocky Mountains. That in Montana is mostly a common variety of yellow pine, useful and valuable for common purposes and for use in the mines

and for railroad building. As a factor in supplying the great agricultural regions it is not of much importance. In Idaho, the quite large belt of what is known as white pine, which reaches a stand of probably 40 billions of timber, of which probably 30 billions may be available for shipment into the agricultural regions, will aid in furnishing a supply for the Missouri Valley, and to some extent for shipment of upper grades into the Mississippi Valley. This timber does not produce a very large percentage of upper grades, but yet is quite available for door stock, where short lengths can be used, and for many purposes where white pine is the most desirable. Going westward into the State of Washington, the timber consists largely of the Douglas fir, one of the most valuable woods for construction, being large, long, straight-grained, very sound, capable of bearing a larger load than any other of the coniferous woods. It grows in dense tracts along the mountains, valleys, slopes, and over the rough mountains up to an altitude of over 6,000 feet. The amount on the ground is greater than that of any other timber on the coast, excepting the great redwoods along the California coast. Its thickest growth exceeds that of the enormous stock of timber on the heaviest growth of the sugar and yellow pine of California, but is fully equaled by the growths of the same timber in the State of Oregon where it attains perhaps equal or greater perfection than in Washington. There is also mixed with this in places fine growths of large cedars, which also grow more or less scatteringly through the fir belts. The larch is also found in places, but not in extensive quantities compared to the fir.

Between Puget Sound and the ocean there is a large area covered to a considerable extent with a fine growth of spruce timber, together with fir. Hardwoods are scarcely in evidence in this State. Fir is most valuable for timber construction of all kinds — posts, joists, beams, bridge timbers, etc. It is valuable for flooring. It can be used, though unsatisfactorily, as inside finish, and is only to a very limited extent useful for doors or sash. Lumbering operations began in this timber to supply the outside market about 1855 or 1860. Within recent years the developments in the lumber and shingle trade have been enormous. The cut reported by the different mills for 1903 amounted to about 2 8-10 billions feet of all lumber,— fir, cedar, spruce, larch, etc. If we take into account the shingle cut of about 7½ billions and reduce it to board measure at the rate of ten shingles to one foot of lumber, it equals 750 million feet. To this should be added something for lumber cut and not reported and some logs and piling taken out of the State on rafts, or on cars or vessels, the aggregate making not less than 3,600 millions, or 3 6-10 billions. Being on Puget Sound and the ocean front, the timber is available for shipment to the countries on or beyond the Pacific Ocean, and to some extent across the Isthmus. At the same time, it furnishes an enormous amount for the overland railways, reaching into the valleys of the upper Missouri and Mississippi and of the Red River of the North and the plains of the Dakotas.

As this timber readily floats in the streams and the logs can be carried to market in that way, it furnishes an opportunity for small milling plants that aid materially in overstocking the lumber market whenever trade is good and prices reach a profitable point. This repeats the business experiences of the older lumber States of overstocking the market and causing a depression in price that leaves no margin of profit. More than 300 shingle and lumber mills were built in this State in 1902 and 1903. The standing timber is estimated at over 200 billions, which at the present rate of cutting, as measured by that of 1903, namely, 3 6-10 billions feet, would constitute a supply for 55 years. But the cut will be greatly increased within the next few years and this estimated time greatly reduced. This State is quite subject to destructive forest fires which in some seasons reach over large areas and kill large numbers of trees, in some places killing all of them, in others, and in general, only scattering trees or patches of timber, such seasons of extensive fires making it necessary for the lumbermen the following year or two to cut out the available portions of the dead timber.

The timber of Oregon, like that of Washington, consists mainly of Douglas fir, with a less amount of cedar, but in the southern tier of counties, is some good sugar and yellow pine, and east of the Cascade Range, a considerable amount of shorter growth, commoner grades of yellow pine. Lumbering in this State has to depend upon railroad transportation more than in Washington, as Puget Sound and the many rivers in the latter State furnish the transportation for logs and lumber that must be done, in large part, by rail in Oregon. There is probably fully as much timber standing in this State as in Washington and nearly as much as in California. It is somewhat more inaccessible, but will, through development and the devices of lumbermen, all be brought into market in the course of years. The lumber cut in Oregon during 1903 was of all kinds, and including a comparatively small amount of shingles and logs taken out of the State, about 800,000,000 feet board measure, being something less than the cut for 1902. The cut may not be greatly increased for a considerable number of years, as there seems to be no prospect of new trunk lines of railway through the State in the near future, and the only line traversing the great timber regions will not furnish much increase in facilities for transporting lumber to market. This timber will probably be cut less rapidly than that of Washington, California, or Idaho.

The State of California contains two of the largest and finest timber belts in the world. The larger and more important of the two includes the sugar pine, the largest and most stately and magnificent of all coniferous trees, and the almost equally magnificent yellow pine or California white pine, intermixed with red and white fir, spruce and cedar. The second belt is the redwood forests of the coast line. The first great timber area extends from Tehachapi Pass, in the southerly part of the State, northerly along

the mountains, valleys, tables, and plains that border the great San Joaquin and Sacramento valleys on the east, and thence up to the Oregon line on the north, a distance of nearly 500 miles. It turns thence and extends around Mount Shasta, and southward along the coast range of mountains that lies west of the Sacramento Valley a distance of 150 miles farther. This pine is very similar in quality to the original white pine of Michigan, Wisconsin, and Minnesota, but is much larger and longer and contains a much greater percentage of clear or upper grade lumber. The size of the sugar pine is, for the matured trees, an average of about five feet diameter at the butt, and eight 16-foot logs in length. Some of the trees are 8 or 10 feet in diameter. Some of them will measure as long as 12 or 13 logs; others only of a short length of 6 or 7 logs. The timber is very soft, fine-grained, elastic, and is not liable to warp. The yellow pine, so named from the color of its bark, is very similar in quality to that of the sugar pine, and is known in the trade as white pine. It averages about four feet in diameter for the matured trees and nearly or quite as great in length as the sugar pine, and will yield fully as large a percentage of clear lumber. The best or better tracts of these two varieties of pine timber, cutting only the trees that are 2½ feet in diameter or larger, and leaving the remainder uncut, as should be the case in this timber, will average 40 per cent of clear lumber, meaning first, second, and third clear; 30 per cent of what is known as first, second and third shop, and 30 per cent of box and other common grades. The red fir growing among this attains to nearly the same size as the pine and about as high. It is a little finer grained,—a little stronger, and more desirable for car timbers and similar purposes than the fir of Oregon or Washington. The white fir is as light or lighter and softer than the pine timber. The trees are smaller in size, have less length of body, and contain a much less amount of clear lumber. It is less valuable than pine, but quite useful for butter and fruit boxes, and is used for inside finish, and is good as common lumber, where not exposed to the weather. The yield of these different kinds of timber for the best tracts will run from 35,000 to 70,000 feet board measure, to the acre, and range in this all the way down to the more scattering pieces that will cut from 25,000 down to 5,000 or 6,000 per acre. The land that is covered with timber will average probably 30,000 to the acre. The amount of timber now standing of these varieties in this pine belt, would probably yield 150 billions of lumber. The amount of this lumber cut in the State the past year was about half a billion or 500,000,000, at which rate of cutting it would take about 300 years to remove the whole of the amount standing. But this is an erroneous method of estimating the duration of this lumber supply. The amount of the annual cut will be increased very greatly and the methods of lumbering which should be, and to very great extent will be, practised, will tend to reproduce a continuous supply by means of forestry methods in cutting out the larger trees and leaving the small ones for future growth.

This great pine belt is the point to which the central portion of the Missouri and Mississippi valleys is looking for its future supply of upper grades for sash and doors, and interior finish formerly supplied by Michigan, Wisconsin, and Minnesota. It is less readily accessible and more remote from the market than were the white pine regions, but is more than equally valuable on account of the quality of the timber, the immense amount found on a given area, and the increasing demand for that grade of lumber. All parts of the white pine regions were available for logging at any time on account of the navigability of the numerous streams that traversed all parts of the timber, upon which the logs could be driven to market. Any of the timber could be marketed from any portion of the interior without waiting for the construction of the railways, logging roads, etc. In California the streams are not drivable. Lumber must be removed by land to the mills and thence by rail into the market. A considerable part of this California timber is easily handled, as the surface of the land is smooth and free from obstructions. Other portions are more difficult, and many almost inaccessible; so much so that many years will elapse before the latter portions will be entered upon for the production of lumber.

Along the Pacific coast from a point a few miles north of San Francisco, up to the southern boundary of Oregon, stands the great redwood belt, in which is found the most extraordinary body of timber in the world. The size of this belt will average about 12 or 15 miles in width, and perhaps 150 miles in length. The timber in places is more dense and contains more lumber to the acre than any other timber area in the world. The larger proportion of the lumber to be cut from this great tract is found in trees that range in size from 6 to 20 feet in diameter and 200 to 300 feet in length. The trees are not only immensely large and long, but stand thickly together on the ground. There are 40-acre tracts to be found that will furnish more than 25,000,000 feet of lumber, and single acres that will cut more than 2,000,000 feet. Sections may be found that will cut more than 100,000,000. The average of the best timbered portions will cut from 60,000 to 100,000 feet to the acre, if cut clean. In quantity of timber on a given area, as well as in size and length of trees, it exceeds that of any other forest. The ground is rough to work over and logging is expensive. The timber is quite defective and a large proportion is necessarily wasted in manufacturing it into lumber. It produces a large amount of clear lumber which is useful for many purposes, but not especially adapted to making door stock or inside finish on account of the inelasticity and liability to being easily marked and scratched. Yet as a timber tract it is very valuable and brings a higher price per acre than any other timber lands that have been sold on the coast. There are probably 60 billions of feet of this timber now standing in this great tract. The redwood cut in 1903 was about 550,000,000 feet. At this rate of cutting it would take over 100 years to cut away this forest. But with the

increased demand the cutting will be greater to meet it. South of San Francisco near the coast is a comparatively small tract of timber known as the "Redwood Basin," in which the State of California has secured a considerable tract of several thousand acres that stand so densely thick and so large and long and with such heavy tops that it makes twilight in the woods on the brightest day. This will be maintained by the State for a perpetual park to show to future generations specimens of the extraordinary timber growth of California that no one can fully appreciate without coming in contact with it. It is quite uncertain as to the success that will come from efforts to re-forest or reproduce in the redwood belt. The proposition to re-forest has not been much discussed or practised, and it is uncertain as to how much if anything of importance will result from any such attempts when made.

The lumber cut during the year 1903 from the four principal western timber States was about as follows, including shingles, etc.:

Idaho	80,000,000
Washington	3,600,000,000
Oregon	800,000,000
California	1,120,000,000
or a total of	5,600,000,000 [ft.] or 5 6/10 billion

Upon the estimated amount of timber standing in these States, namely:

Idaho	40
Washington	200
Oregon	200
California	225
	665

At the rate of cutting in these States for 1903, namely 5 6-10 billion, this estimated amount standing would be exhausted in about 120 years. But the annual cut in the future will be greatly increased until it will probably reach an average of 15 billion during the next 20 years from 1903. So that judging the future by the past and taking into account the increasing demand for lumber it is apparent that the present stock of timber left standing will furnish a supply for only a comparatively few years of such extravagant general consumption and wasteful methods of logging and manufacturing lumber and of indifference or inattention to re-foresting. The excessive consumption of lumber in the United States, greater by far than in any other part of the world, per capita, must, in the comparatively near future, be slackened up or the supply will be so exhausted that substitutes will have to be found, or serious inconvenience and discomfort will result. Timber culture must be entered upon and consumption must be decreased. This will only partially provide for the necessities of the future, at least as we now look upon the uses for which lumber is essential. In the older timber States when the land is cut over it is desirable for agricultural purposes, and this has been a strong factor in shearing off the timber, as the land when the timber was removed was occupied by settlers, so that the tax levy could be continued after the timber was gone, by placing it upon the settlers who took the lumbermen's places. But on the Pacific coast, the conditions are different. The timber generally grows on the upper tables on the mountains and in the cañons. On the high plains where the lands are useful only for grazing purposes, after the timber is gone, the grazing is poor and not as good when the timber is all removed as where the proper methods of forestry have been applied and a continuous growth maintained. The expectation is that the tax assessment on the timber before and after it has once been cut will be moderate and reasonable, so that the holders of the timber can afford to maintain right forestry methods and so continue the timber supply indefinitely. This method should consist in cutting away about one fourth of the trees, taking out those that range from three feet up in size, and leaving the remainder, which, being smaller in size, will increase more rapidly in diameter, and in the course of 30 to 50 years, another equally large number of large trees, though not quite as large as the first, will be available for cutting. In this way, a partial supply can be maintained and continued indefinitely. Of all the materials required for the sustenance and comfort of the human race, next to that of the food supply comes wood, in its various uses. It has been to the present time, far more of a necessity and an essential than coal or iron or other products of the mines. Yet with all its essential attributes, up to the present, and still continuing, into the future, the supply is not inexhaustible, and the earth does not seem to be capable of reproducing a stock sufficient to maintain anything like a supply to fill the demands of what now seems necessary for the comfort and welfare of the human family. The enlarged demand for agricultural lands, through the increase of population, and the opening up of all parts of the country and of the world, will sweep away a large portion of the timber areas and in this way not only cut away the original forests, but prevent the land from being used to reproduce another supply excepting to a limited extent. The mountain regions where timber will grow and where the land is more unfit for the raising of food supplies, may be utilized for the purpose of supplying the demand for lumber. But this will necessarily furnish so limited an amount that when the present stock is practically consumed, the people of this country as well as of the whole civilized world will be compelled to use substitutes for a large proportion of the purposes for which wood is now so universally used.

The increasing use of iron, mostly in the form of steel, will undoubtedly be extended very greatly. This, with stone and brick, and the probable enlargement of the production of aluminum, and its great durability and strength, will continually supply a proportionately larger part in all the structures. And it is probable that compositions made from ground wood, cemented into boards or sheets and covered or compounded with drying oils or varnish, will add a factor in furnishing substitute materials. The people of this country have never fully appreciated the heritage of the great timber supply which has been so wantonly destroyed and wastefully used, without the slightest effort or thought, until recently, of any necessity to economize in preserving the forests or in any manner provide for a future supply. In recent years

and to an increasing extent, attention has been called to the necessity for applying less wasteful methods in lumbering operations and to consider the question of re-foresting. The government has taken very progressive steps in the way of preserving the remaining forests, mostly in the western mountains, where the immense forest reserves are laid out, and in providing a forestry department to investigate methods of reproduction of timber and of handling the same, and the education of trained foresters, and of the people in all matters pertaining to the lumber and wood supply. And yet in the face of this well known condition of the limited wood supply, the consumption in this country is continually on the increase per capita, without any indications of a change in this respect. The private ownership of timber lands continually tends, through desire for quick returns, to an excessive supply of lumber and other wood products, which added to the increased use of wood in paper-making, and the demand for box lumber for shipping purposes, which seems to be steadily increasing, proportionately, are all pointing to an early exhaustion of our timber supply. And it seems inevitable that this will continue until the private holdings are largely exhausted and the government reservations are reached. Then of necessity the per capita use of lumber, which is now in this country at the rate of nearly 400 feet per capita of lumber and shingles, of coniferous varieties, and 100 feet of hardwood, will necessarily be reduced to even less than that which is now consumed in Europe of about one quarter or one fifth of this amount. As population increases, land for agricultural purposes will be increasingly in demand and will reduce constantly the available quantity of land that can be utilized for obtaining or reproducing a wood supply.

By the time our native forests have in the main become exhausted the other timbered regions of the world will be in large part denuded and we cannot then rely to any great extent upon outside or foreign supply. Some pine and fir will still be coming from Canada and British Columbia and some pine from Mexico, hardwood and cabinet woods from Central and South America and the Philippines. But in the comparatively near future we must obtain our principal wood supply by re-foresting and reproduction of timber, and the earlier date at which this becomes generally understood and its importance more clearly apprehended, the better protected may be the interests of the public in the future and the inconvenience and misfortune of a timber famine to a greater or less extent avoided. See also Lumber Industry.

I. B. Walker,
Timber Expert.

Timbrel, a musical instrument much resembling a tambourine (q.v.), has been in use since the earliest times. It is mentioned in the first book of the Old Testament (Ex. xv. 20), and seems to have been known to all ancient peoples. It is also known as the tabor, tabret, tambor, etc., and its form varies from the bottle-shaped drum of Egypt or the long narrow drum of Provence, to the modern tambourine of Spain.

Timbuktu, tĭm-bŭk'too, French Sudan, a celebrated trading station situated on the great bend of the Niger River, on the southern border of the Sahara, in lat. 16° 43′ N., and lon. 2° 57′ W. The city lies in a desert region about nine miles from the banks of the river. It measures three miles in circumference, and consists of adobe houses without windows. In the centre are three large mosques, and on the northern outskirts two forts. The commerce by caravans across the Sahara was formerly enormous, is still considerable, and again increasing. The trade is chiefly in ostrich feathers, rubber, salt, cotton, tobacco, sugar, and gold. Recent excavations have disclosed ancient Egyptian architecture pointing to a prehistoric foundation. The modern city was founded toward the end of the 11th century, and became known to Europeans in 1373. Owing to its former difficulty of access Timbuktu was long an object of curiosity for travelers. The French took possession of it in 1893. Pop. (1904) about 12,000, almost all Mohammedans. Consult Dubois, 'Timbuctoo, the Mysterious' (1896).

Timby, Theodore Ruggles, American inventor: b. Dover, Dutchess County, N. Y. 5 April 1822. He early showed inventive powers, "was an inventor from childhood," says Parton, and at 16 invented the floating dry dock. Among his other inventions are those of floating batteries of iron and steel for coast-defense; a method of sighting and firing heavy guns by electricity, patented in 1862 at Washington, afterward adopted by the United States government, and now used in all leading countries; the American turbine wheel; the first portable barometer; the process of printing terrestrial globes in colors; and a process for quickly ripening coffee. He was the first to advocate the modern use of iron in the construction of warships, and his most famous invention is the revolving turret which was first introduced in the original Monitor (see Monitor, The; Monitor and Merrimac), and has since been adopted in naval architecture throughout the world. This invention, through official neglect and other failure to recognize and proclaim Timby's contribution to the national defenses that gave victory in "the battle upon which hinged the fate of the Civil War," has been wrongly ascribed to John Ericsson (q.v.), chief engineer of the Monitor. But the true history of the case shows that as early as 1841 Timby exhibited at the War Department a model and plans of a revolving battery, to be made of iron, the idea of which was suggested to him when first he observed the circular form of Castle William on Governor's Island, New York harbor. In 1843 he made his first record of the model and plans in the United States Patent Office. From 1851 to 1861 he urged their importance upon the Emperor Napoleon III., but without practical result. Meanwhile, having developed improvements in his invention, he took out patents under which he entered into an agreement with the builders of the Monitor, including Ericsson, for its use in the construction of that vessel, and received therefor $5,000. He also received $5,000 royalty for each of the two subsequent vessels built by that company.

Although this American inventor has received no compensation and no official recognition of his services to the country, his claims have not been officially disputed. His invention

of the revolving turret, as well as of the "Timby system" of coast-defense, adopted by many nations, has been acknowledged by military and naval authorities at home; the legislature of New York passed (1890) a concurrent resolution declaring it to be the "duty of Congress to make such investigation . . . as shall do ample justice in the premises and vindicate the genius that contributed so largely in rescuing the country from a grave peril during the darkest days of its existence"; and influences are now at work in Congress and elsewhere to secure full acknowledgment of his patent rights and remuneration for his work from the United States government. Bills to this end were introduced in the national Senate in 1893 by the senators from New York. Theodore Ruggles Timby is now a resident of Brooklyn, N. Y., where he occupies himself with various literary and other avocations, being especially interested in scientific and philosophical pursuits. Among his writings is a volume entitled 'Lighted Lore for Gentle Folk' (1902), which contains his reflections on a variety of subjects. Consult: New York *Herald* and New York *Evening Post*, 7 June 1843; 'Harper's Monthly,' January 1863, pp. 241–8; 'American Annual Cyclopædia,' 1864, "Revolving Turrets," pp. 719–23; Todd, 'Nuts for Boys to Crack' (1866), p. 166; Parton, 'The People's Book of Biography — Lives of the Most Interesting Persons of All Ages and Countries,' containing a sketch of Timby and an account of his connection with the Monitor; King, "Theodore R. Timby" (in 'Successful American,' January 1902); 'American Shipbuilder,' 23 Oct. 1902, "A Half-forgotten Hero"; and Memorial of the Patriotic League of the Revolution to the 57th Congress, presented by Virginia Chandler Titcomb, 1902.

JOHN H. CLIFFORD,
Editorial Staff, 'Encyclopedia Americana.'

Time is the general idea of successive existence, or that in which events take place, space being that in which things are contained. Relative time is the sensible measure of any portion of duration, often marked by some phenomenon, as the apparent revolution of the celestial bodies, especially of the sun, or the rotation of the earth on its axis. Time is divided into years, months, weeks, days, hours, minutes, and seconds (see CALENDAR), but of these only the years and days are marked by celestial phenomena. The instruments employed for measuring time are clocks, watches, chronometers, hour-glasses, and dials. (See CLOCK.) Several kinds of time are used by astronomers, such as mean, solar, apparent, and sidereal time.

Solar Time.— Apparent solar time is measured by the daily motion of the sun; the interval between two successive upper transits of the sun over the same meridian is an apparent solar day, which is divided into 24 hours, and the hour angle of the sun at any instant is called apparent solar time. But these days are of unequal length, owing to the obliquity of the ecliptic and the variable motion of the earth in its annual orbit, hence it would be difficult to regulate clocks to follow the real sun, and in order to secure uniform time, a mean sun is supposed to move in the equator with uniform velocity and to keep as near to the real sun as is possible under these conditions. This mean sun measures mean solar time; it is sometimes ahead of and sometimes behind the real sun, but never differs from it more than about 16 minutes. Clocks in general use and navigators' chronometers are regulated to this time. The difference between apparent and mean time is called the equation of time.

Sidereal Time.— Sidereal time is measured by the stars, or rather by the daily motion of that point in the equator from which the true right ascension of the stars is reckoned, called the vernal equinox. Two successive upper transits of the vernal equinox over the same meridian determine a sidereal day, which is nearly 3 minutes and 56 seconds shorter than a mean solar day, but divided, like it, into 24 hours. About 21 March the sidereal and mean times agree; the former gains on the latter an entire day in the year.

Day Measurement.— The civil day commences at midnight, and is divided into two periods of 12 hours each; the first is marked A.M. and the second P.M. The astronomic day commences at noon on the civil day of the same date, or 12 hours later than the civil day, and the hours are counted from 0 to 24. The sidereal day commences at the instant the vernal equinox makes its upper transit, and, therefore, changes in 12 months through the entire 24 hours. The hours are counted from 0 to 24.

Time Determination.— Time may be determined by observations on the sun or stars with a sextant, or an altazimuth for rough purposes, or with a transit adjusted to the meridian, for refined work. With the last instrument a chronograph is frequently used for recording the observations. The telescope usually has from 5 to 11 equidistant lines ruled on glass (or spider lines), which are placed in the common focus of the eye-piece and object glass, the centre line being adjusted to the optical axis of the telescope and set in the meridian. When ready for observations, the observer sets the telescope at the proper angle to observe the passage of the star across the meridian, and records on the chronograph the transit over each line by interrupting the circuit with an observing key held in the hand and electrically connected with the chronograph, on which a break-circuit chronometer is making a continuous record. The chronograph sheet is read by means of a scale.

Standard Time.—A system of reckoning time used chiefly for the convenience of railroads in the United States, established by mutual agreement in 1883, on principles first suggested by Charles F. Dowd, of Saratoga Springs, N. Y. The United States, beginning at its extreme eastern limit and extending to the Pacific coast, is divided into four time-sections: Eastern, central, mountain, and Pacific. The eastern section, the time of which is that of the 75th meridian, lies between the Atlantic Ocean and an irregular line drawn from Detroit, Mich., to Charleston, S. C. The central, the time of which is that of the 90th meridian, includes all between the last-named line and an irregular line from Bismarck, N. D., to the mouth of the Rio Grande. The mountain, the time of which is that of the 105th meridian, includes all between the last-named line, and the western

boundary of Montana, Idaho, Utah, and Arizona. The Pacific, the time of which is that of the 120th meridian, includes all between the last-named line and the Pacific coast. The difference in time between adjoining sections is one hour. Thus, when it is 12 o'clock noon in New York (eastern time) it is 11 o'clock A.M. (central time) at Chicago, and 10 o'clock A.M. at Denver (mountain time), and at San Francisco, 9 o'clock A.M. (Pacific time). The true local time of any place is slower or faster than the standard time as the place is east or west of the time meridian; thus, the true local time at Boston, Mass., is 16 minutes faster than eastern standard time, while at Buffalo, N.Y., it is 16 minutes slower, the 75th time meridian being half way between Boston and Buffalo. Local time and standard time agree at Denver, Colo., as Denver is on the 105th meridian, that of the mountain section.

Universal Time.— This is an astronomical method of reckoning time for international purposes, agreed on by the International Conference, held at Washington, D. C., in 1883. Universal time is reckoned from mean noon, the day commencing at midnight, and divided into 24 (instead of into two portions of 12) hours each. Local time will still be used for local purposes; but the method of fixing it will be changed. Since the earth is divided into 360° and the day into 24 hours every 15° will represent the difference of an hour in time. If the earth be divided into 24 equal parts, at every 15th meridian, and if the local mean noon of such meridians be adopted as the standard noon of all places 7½° each side of it, it will follow that when it is noon at Greenwich and at all places with 7½° of Greenwich, it will be 11 o'clock by local (but still noon by universal) time for all places between 7½° and 22½° west of Greenwich, and 13 o'clock by local (but still noon by universal) time for all places between 7½° and 22½° east of Greenwich, and so on throughout the world. Universal time will be the same universally, and local time will differ from it only by even hours, instead of by the various odd minutes by which local standards differ from each other at the present time; while in no case will the difference between standard noon and absolute noon at any place exceed half an hour, since a difference of 7½° of longitude equals a difference of half an hour in time.

Time Signals.— Many observatories send out time signals either daily, hourly, or sometimes continuously every second, or every other second, to various parts of the country for the purpose of giving accurate time to all sorts of industries. They are sent over the telegraph lines, the wires being permanently run into the observatories for the purpose, and the signals are generally sent automatically by a distributing clock which is kept as near the exact time as possible. An electric current passes through the clock and is broken or closed regularly by a toothed wheel on the second hand arbor of the clock. Perhaps the best known set of time signals is that sent out by the Naval Observatory at Washington. It is as follows: three or four minutes before noon, whenever the telegraph companies switch in the loops to the observatory, the clock begins to send out make-circuit signals every second over the various lines, the minutes being indicated by leaving out the seconds 55, 56, 57, 58, and 59 in each, and the half minutes by leaving out the 29th second of each The click following such a one-second gap then always indicates the beginning of a half-minute, and the first following a gap of five seconds indicates the beginning of a minute, except at the exact noon. Just before this there is a gap of 10 seconds, and then exactly at noon the circuit closes and remains closed for just a whole second, the beginning of the mark indicating exact noon. The closing for a whole second is in order to make sure that that particular mark goes through all the telegraph lines, for this particular signal is made to do a great many things at different places, such as the dropping of time balls, and it is more important that this particular second be distinctly sent than any of the others. After the break at the close of the noon signal the telegraph companies quickly switch out the loops to the observatory, and the lines immediately resume their normal work. In the city of Washington this particular noon signal drops a time ball on the top of the State, War, and Navy Department Building, and it also automatically corrects, by setting forward or back exactly to 0 hours 0 minutes 0 seconds, all the clocks in the department buildings of the government, no matter how much they may have gained or lost since the preceding noon.

Time, Measurement of. All our measures of time depend primarily upon the motion of the earth upon its axis and around the sun. The first motion enables us to count off the successive days; the other the successive years. The measurement of time thus becomes a most important branch of practical astronomy in the affairs of men. It falls into two distinct classes, the determination of the years, and that of the days or fractions of a day. Other units of time than this may be regarded as subsidiary. Centuries are determined by the count of years; weeks and months by a count of days; hours, minutes and seconds by dividing the day into fractions.

The primary object of a measure of time is the expression or determination of the moment or date of any event. This is expressed by the period of time elapsed since some standard moment or epoch. Long intervals, expressed in years, are measured from some great epoch chosen by a nation — in all Christian nations the birth of Christ is taken for this purpose. The general subject of measuring or expressing long intervals of time is treated in our article Chronology (q.v.). The present article deals mainly with fractions of a day, or with what is commonly called the "time of day."

To express the time of day we must have a moment at which we consider the day to begin, and from which we count the hours and minutes. The natural moment for this purpose is that when the sun crosses the meridian, because it can be more easily observed than any other phenomenon growing out of the earth's rotation. This moment is actually taken as the beginning of the day by astronomers on shore and, to a large extent, by navigators at sea. The latter usage grew out of the fact that at noon the navigator determines the latitude of his ship. But, to express the moment of an event, navigators are now beginning to count

from midnight, as landsmen habitually do. The Jews formerly considered the day to begin at sunset, and the practice in ancient times was to divide the 24 hours into two parts, the day and the night. Each of these parts was divided into 12 hours. Thus men had the first, second and third hour of the night, etc., and the corresponding hours of the day, as we see in the Bible. Owing to the inequality in the length of the day at different seasons of the year, the hours thus employed were of unequal length. In an age when the modern clock was unknown, and there was no accurate instrument for measuring time in universal use, this inequality was of little importance. But when an accurate measure was once obtained, a more uniform measure of the hours became necessary. For obvious reasons midnight became the most convenient time to begin the day of 24 hours. Thus arose the system of setting the clocks at 12 when the sun crosses the meridian, beginning a new day 12 hours later when the clock marks midnight, and dividing the hours into A.M. and P.M. This system was adopted without change until the introduction of railways showed its defects, and made a slight modification necessary.

The first inconvenience felt from the system arose from the fact that the intervals between successive noons, as indicated by the passage of the sun across the meridian, are not equal. To show the nature and effect of the inequality, let us suppose a perfect clock so regulated as to go always at the same rate, and to be set at noon on January 1 of any year at the moment when the sun crosses the meridian, and to be so exactly regulated as to again show noon on January 1 of the year following. It will be found that, during the month of January, the clock will continually gain on the sun at a rate of 28 seconds a day at the beginning of the month, which rate will continually diminish to 8 seconds at the end of the month, and will change to a losing rate about the middle of February. The effect of the accumulation will be that, at the latter date, the clock will be found to be more than ten minutes ahead of noon when the sun crosses the meridian. Then it will begin to fall back for several months until, in May, it will be seven minutes slower than the sun. Then it will forge ahead again, and again fall behind until, when January again comes around, it will once more coincide with the sun.

This inequality between the moments of the sun's successive transits over the meridian is due to two causes; the obliquity of the ecliptic, and the eccentricity of the earth's orbit. If, instead of using the sun, we measured time by the apparent diurnal motion of the stars, no inequality would be noticeable. The effect of the eccentricity is that the sun seems to move forward among the stars more rapidly in the winter months than in those of summer. And the effect of the obliquity of the ecliptic is a still larger inequality, going through its cycle of change twice in a year.

So long as an error of moderate fractions of an hour was of no importance, people in general had no occasion to trouble themselves with this inequality; but when time had to be measured to a minute, it became intolerable, and the system of mean time had to be introduced. The latter is defined by the going of a perfect clock, in the manner already supposed, and so set that, in the average of the whole year, it shall be as much ahead of the sun as behind it. The greatest difference between the clock and the sun will then be about 16 minutes, which difference occurs in one direction about early in November, and in the other about the middle of February. The difference is called the *equation of time* and is given for each day in the household almanac, thus enabling the household clock to be set by the sun. Some such system as this is now used in all civilized countries where exact time is of importance.

Another relation which was of little immediate importance in former generations, but which became very important when railways began to run, was that of the relation of time to longitude. We readily see that, as the earth revolves, the various meridians on its surface are brought into line with the sun. Another way of conceiving the case is to think of noon as continually traveling around the earth from east to west. The rate of motion is one hour for every 15 degrees of longitude. What is true of noon is true of any other hour of the day. Any such hour is about three hours crossing the continent from the Atlantic coast to San Francisco. The result of this is that if a passenger with a good watch travels westward, he will find his watch continually ahead of the time at the places he reaches. Of course the opposite effect is produced when he travels east. Before 1883 this relation of time was productive of endless confusion on railways everywhere. Conductors could not be changing their watches every minute as they traveled east or west, and thus every railroad had to adopt some meridian as that by which it kept its time. There were, therefore, almost as many meridians as railroads, and passengers frequently missed their trains by not knowing what time to go by.

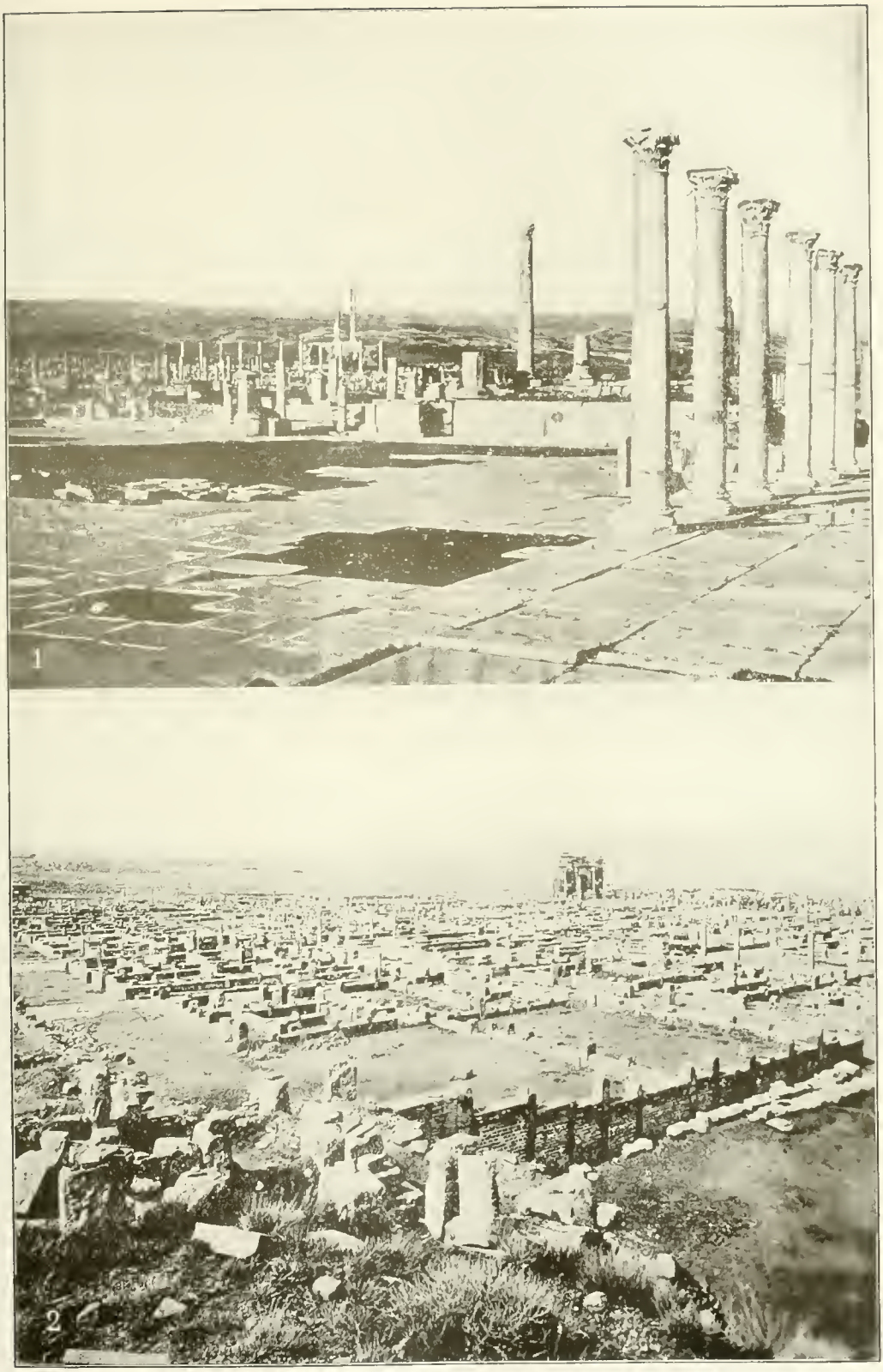
In 1883 was introduced our present zone system, which is now used over almost the entire country, and is rapidly being introduced into Europe. This system consists in dividing the country into zones by meridians of longitude, 15 degrees, or one hour apart. The central meridians of the zones used in the United States and Canada are those of 60 degrees west of Greenwich, 75 degrees, 90 degrees, 105 degrees, and 120 degrees. The lines dividing one zone from the next are arranged, as nearly as convenient, to run about midway between these meridians. Within each zone one and the same time is used. The different zones, as thus marked out, are shown on the accompanying map.

The result of this system is that, so long as a traveler journeys only within a single zone, he finds the time to be everywhere the same. But when he crosses the line from one zone to the next, the time suddenly changes by one hour. In traveling from New York to San Francisco he crosses three of the zone lines, so that, on arriving at his destination, the time will be three hours slower than in New York.

It should be carefully understood that in this system of expressing time, which we now use throughout almost our entire country, the time actually used is not the true time of day, as indicated by the sun, except on the standard meridians. It does not correspond to sunrise

1. The Arch of Trajan.

2. Mosaic Pavement in the Court of the Baths.



1. The Forum and Capitol. 2. General View from the Summit of the Theatre.

or sunset, as given in the almanacs. At midway points, Cincinnati, for example, the time used is necessarily in error by almost half an hour in one direction or the other. But the inconvenience thus arising is very slight. Consequently, if any one determines his time by the passage of the sun across the meridian, he must correct it according to his longitude, from his standard meridian, in order to obtain the standard time. The inconvenience thus arising is very small compared with the advantages of the uniformity to which the system gives rise.

As railways are extended over the country the public depends for its time less and less on actual observation of the sun, and more upon the railways. The latter get their time from several of the leading observatories in various parts of the country, which are supplied with clocks accurately corrected by astronomical observations. Every day at noon, or some other designated hour, the moment is telegraphed from the observatory to the lines of railway in connection with it, and the clocks are set accordingly.

S. Newcomb.

Tim'gad, Algeria, the ancient Roman city Thamugadi, in the department of Constantine, near Lambèze, a few miles east of Batna on the Philippeville-Biskra railroad, is approached through a valley bounded by the Aures Mountains, and stands on the northern fringe of the African desert. It was a fortified frontier town at the junction of six roads, and was founded in 100 A.D. by Lucius Munatius Gallus. It flourished for three centuries, and then underwent various vicissitudes, owing to native insurrections and the incursions of the Vandals, in 535 being partially destroyed. Four years later, under the Byzantine general Solomon, it was restored and had another period of prosperity until the Arab invasion of 646, when the Christian governor Gregory of Timgad was defeated and killed, the town being subsequently abandoned, falling into ruins, and gradually becoming buried beneath the desert sands. Recent excavations undertaken by the French government have revealed ruins, which for beauty, architecture, and magnificent extent, have gained for Timgad the title of the "African Pompeii." Nearly the whole of the city has been laid bare (see illustrations) and exhibits the usual Roman platting, two main streets, the Decumanus Maximus extending east and west, and the Cardo Maximus intersecting at right angles, upon and around which the city was built. The principal buildings are on the main streets, and among the prominent civic features are the magnificent triumphal arch of Trajan, the Forum, with the theatre, basilica, and other buildings surrounding it, the Temple of Jupiter Capitolinus, statues of the Roman emperors, a Byzantine fort, the Christian basilica and cathedral erected by Gregory, the governor already mentioned, houses and stores, markets and annexes, thermæ, and latrinæ. The arch of Trajan, the finest Roman construction of its kind in northern Africa, and the dominating attraction of Timgad, bears an inscription which translated reads:

The Emperor Cæsar Nerva Trajan Augustus Germanius, son of the divine Nerva, sovereign pontiff, four times tribune, three times consul, father of his country, founded the Marcian colony, Trajan of Thamugadi, by the help of the third Augustus Legion, Lucius Munatius Gallus being the legat imperial proprietor.

The epigraphic wealth of the city is considerable, including inscriptions to early Christians, showing that they were persecuted and underwent martyrdom, while others bear such historical names as Novatus, a member of the Council of Carthage in 258; Sextus in 320; Faustinius, opponent of Gaudentius the Donatist, in 411; and Secundus, bishop of Numidia, exiled by Hunneric in 484.

C. Leonard-Stuart,
Editorial Staff, 'Encyclopedia Americana.'

Timoleon, tĭ-mō'lē-ŏn, Grecian commander and liberator of Sicily: b. Corinth in the 5th century B.C.; d. Syracuse 337 B.C. He was accused of having caused the death of his brother, Timophanes, the head of the state, and is said to have exiled himself from Corinth for 20 years in consequence. Little is known of his life until he entered the service of the Greek cities of Sicily in the effort to expel their Carthaginian invaders, an undertaking in which he met with signal success. In 343 he drove Dionysius from Syracuse, and in 339 secured a treaty by which the Carthaginians were confined to the territory east of the Halycus. In the cities thus freed from their enemy, he restored democratic government, and was looked upon as the defender of their liberties. In Syracuse he not only restored ancient rights, but gave its citizens a new and yet more liberal constitution. Consult Plutarch's 'Lives.'

Timon, tī'mŏn, Athenian misanthrope: b. near Athens. He flourished in the latter part of the 5th century B.C., and the ingratitude of his friends so greatly embittered him that he retired into solitude. His name has become proverbial as descriptive of a misanthrope. He formed the subject of a famous dialogue by Lucian and his story is familiar through Shakespeare's tragedy, 'Timon of Athens.'

Timon of Athens, a tragedy by Shakespeare, produced in 1607–8 and first printed in 1623. It contains much probably from another pen than Shakespeare's, and is a bitter satire on friendship and society, written in the stern sarcastic vein of Juvenal. The sources of the plot seem to have been Paynter's 'Palace of Pleasure,' Plutarch's 'Life of Antony,' and Lucian's 'Dialogue on Timon.'

Timor, tē-mōr', an island of the Malay Archipelago, the most eastern of the Lesser Sunda Islands, 700 miles southeast of Borneo; length, 300 miles; width, 60 miles; area, 12,450 square miles. The coasts are steep, and generally difficult of access on account of coral reefs; the island is traversed by a mountain chain everywhere giving evidence of volcanic origin; the interior is very little known. The vegetation is less luxuriant and less varied than in the other islands of the East Indies. The coast lands are cultivated to some extent, the northern part of the island being more favorable to agriculture than the southern. Coffee, rice, sugar, and cocoanuts are grown, but mostly for domestic use only; some coffee is exported, also sandalwood, wax, trepang and tortoise shell. Horses and cattle are raised, and a few exported. There is considerable mineral wealth, but it has not been developed. The people are partly Malays, and partly Negritos, with a few Chinese, who control the trade. The island politically is divided between Portugal and Hol-

land, the northern part (7,450 square miles) being Portuguese, the southern part (5,000 square miles), Dutch. This division was first made by treaty in 1859: and the boundaries and relationship of the two countries more exactly defined by another treaty in 1893. The Dutch capital is Kupang, the Portuguese Deli. Pop. (estimated) 400,000.

Timorlaut, tē-mōr'lowt, a group of islands of the Malay Archipelago, lying between Timor Island on the southwest and the Aru Islands on the northeast, southwest of New Guinea. The group consists of Yamdena (or Timerlaut), Selaru, Larat, Vordate, Molu, and Maro, and a number of small uninhabited islands. The larger islands are hilly, the maximum elevation being 820 feet; the others are low and flat, of coral formation. Agriculture is carried on in a primitive fashion; some cattle are raised; turtle fishing is an industry of some importance, and turtle and trepang are exported.

Timotheus, tī-mō'thē ŭs, Greek dithyrambic poet: b. 357 B.C. He was the most famous lyric poet of his day and introduced a chorus in singing the Nome (Vopos) and mimetic action to give spirit to the rendering of that song or melody. A collection of fragments of his poems are to be found in Bergk's 'Poetæ Lyrici Græci.'

Timotheus, Athenian general: b. about the end of the 5th century; d. Chalcis in Eubœa, 354 B.C. In 378 he was made commander of the fleet sent out by the Athenian Confederacy to gain the alliance of the Peloponnesian cities, and of those along the coast of Laconia, and defeated a Spartan fleet in 375. Peace having been declared with Sparta, he was recalled to Athens. In 372, having been sent to the coast of Asia Minor to aid the satrap of Phrygia, he secured the island of Samos, and by the further acquisition of Sestus and Crithote gained for Athens the control of the Hellespont. In 356 he was appointed, with Chares and Iphicrates, to the command of an expedition against Byzantium, but, refusing to engage in a battle in what he deemed an unpropitious moment, he was accused by Chares of causing the Athenian defeat, and was deposed from power.

Tim'othy, a disciple of Saint Paul: b. in Lycaonia, Asia Minor, probably at Lystra, of a Gentile father and Jewish mother. His father's name is unknown; his mother's was Eunice, his grandmother's Lois. By his mother and grandmother he was early made familiar with the Old Testament Scriptures, and it seems likely that by them also he was first instructed in the Christian faith, which they had probably been won over to on Saint Paul's first missionary visit to Lystra, while Timothy was still very young. When Saint Paul, along with Silas, visited Lystra on his second missionary journey, seven years after the first, Timothy became an active fellow-worker with the apostle, and he accompanied him and Silas in the further course of their mission. Timothy accompanied Paul to Philippi and Berœa; but he is not mentioned as being with Paul at Thessalonica, which the apostle visited after Philippi and before Berœa. He was then left in the last-mentioned city alone, but rejoined Paul at Athens, from which city he was sent back to Thessalonica. After remaining there some time he once more joined his master at Corinth. No further mention is made of Timothy till at least five years later, when he is found with Paul at Ephesus on his third missionary journey. From Ephesus he was sent along with Erastus into Macedonia and Achaia to prepare the churches there for the visit that Paul himself was meditating (Acts xix. 22). Timothy met the apostle again in Macedonia, and was among those who preceded him on his journey to Jerusalem. We lose sight of him for the next two or three years; but he appears at Rome with Paul at the time when the epistles to the Colossians, Philippians, and Philemon were written. From the third verse of the first chapter of the first epistle to Timothy we learn that Timothy was on one occasion left at Ephesus when Paul went into Macedonia, and it is supposed that this was after Paul had been released from the confinement in which he was placed when he was sent to Rome from Jerusalem. Tradition makes Timothy the first bishop of Ephesus. He is said to have been martyred in the reign of Domitian or Nerva.

Timothy, Epistles to. These two epistles of Saint Paul, along with that to Titus, are called the pastoral epistles. By the early Christian fathers they were almost universally accepted as genuine. They are ascribed to Paul in the Syriac version of the Scriptures known as the Peshito, believed to belong to the 2d century, in the Muratorian fragment, a list of the works of the New Testament supposed to have been compiled about 150; and in the catalogue of Eusebius, who places them among the homologoumena (acknowledged). The other external testimony to their genuineness is also strong. They were, however, rejected by some of the Gnostic heretics, as Marcion and Basilides. Tatian accepted the epistle to Titus, but rejected those to Timothy. The question of their genuineness was revived in modern times, at the beginning of the 19th century, by Schmidt and Schleiermacher, who admitted the genuineness of second Timothy and Titus, but assailed that of first Timothy. Eichhorn and De Wette denied that any of these epistles was written by Paul, but admitted the canonical authority of them all. More recently, Baur, disregarding external testimony altogether, has assigned them to the latter half of the 2d century. The chief grounds on which the genuineness of these epistles is questioned are the difference of their style as compared with that of the acknowledged epistles of Saint Paul, the assertion that the heresies alluded to in the epistles betray a later age, and that the ecclesiastical polity of the epistles is too complete to belong to the time of the apostles, and the difficulty of finding any part of the apostle's life to which they can be assigned. This last difficulty is generally got over by biblical critics by assigning them to a period after the close of the narrative in the Acts, and the second epistle to Timothy while Saint Paul was undergoing a second imprisonment at Rome.

Timothy. See GRASSES IN THE UNITED STATES.

Tim'rod, Henry, American poet: b. Charleston, S. C., 8 Dec. 1829; d. Columbia, S. C., 6 Oct. 1867. After study at the University of Georgia and some legal education, he was for a time a tutor, at the outbreak of the Civil War became war correspondent of the Charleston

Mercury, and in 1864 was made assistant editor of the *South Carolinian* at Columbia. The destruction of Columbia by Sherman was the ruin of his occupation, and his subsequent career was unfortunate. Just previous to the war-time, Timrod and P. H. Hayne (q.v.) were brilliant members of that Southern literary coterie in which W. G. Simms was the most prominent. In 1860 a small volume of his poems appeared, but with little recognition. Done under unfavorable conditions, Timrod's poetry has many excellent qualities, and in some cases attains real elevation. Among his best pieces are 'At Magnolia Cemetery'; 'Charleston,' and 'The Cotton Boll.' A memorial to him was placed in Washington Square, Charleston, in 1901. His verse was collected and published, with a biographical sketch, by Hayne in 1873. An edition, with memoir, in 1899, was followed in 1901 by the so-called memorial edition.

Timuquoman Family, a group of American Indians formerly occupying central and northern Florida. In 1527 — when first known to the Spaniards — these Indians had some 50 settlements along the Sain John's River. There were five original tribes speaking as many dialects. Wars of other tribes and the inroads of the English from Carolina gradually reduced the tribes in numbers, and they fled to Volusia County, at the headwater of the Saint John's. The territory thus abandoned was afterward occupied by the Seminoles (q.v.).

Timur, tē-moor' (Timur Beg, Timur Leng, Tamerlane, the latter a corruption of Timur Leng, "Timur the Lame"), Mongol conqueror: b. Kesh, near Samarcand, about 1336; d. Otrar 17 Feb. 1405. He was a descendant of Genghis Khan, and became chief of his tribe in 1370, having previously reigned jointly for some years with his brother-in-law Hussien, of whom he became jealous and whom he put to death, after defeating him in a short civil war. He established a firm government in his dominions, and then embarked on his career of conquest. He subdued Persia and the whole of central Asia from the Great Wall of China to Moscow, and in 1398 invaded India, which he mastered from the Indus to the mouth of the Ganges. His cruelty knew no bounds. On one occasion, it is recorded, he massacred 100,000 prisoners, while on the banks of the Ganges he was called by the Emperor of the East and other princes to aid in repelling the Turks under Bajazet. He wrested Syria from the Mamelukes on his return journey, overran the sultan's dominions with his vast army, and on 20 June 1402 met Bajazet on the plain of Angora, routed his immense army, and took him prisoner. In 1404 he began preparations for an expedition into China, and early in 1405 began the advance which was stopped by his death. Timur, however, was not a mere barbarian. He was an able administrator, with many statesmanlike traits, a patron of science and art, and is also reputed to have been an author, though on dubious evidence. Consult Howorth, 'History of the Mongols.'

Tin, a hard, white, ductile metal, obtained by smelting tin-stone. Tin appears to have been known in the time of Moses; and at a somewhat later period in Jewish history it was brought by the ships of Tarshish from the islands east of the Persian Gulf. The Phœnicians traded largely in the tin ores of Cornwall, which was then, as now, celebrated for its mineral wealth. The mountains which separate Galicia from Portugal were also very productive of tin in ancient times, and still continue unexhausted. The mountains between Saxony and Bohemia have been wrought as tin mines for several centuries, and still continue productive. Mines of it occur in the Peninsula of Malacca, in India, in Chile, in Mexico, in Peru, etc. Large deposits of tin-stone have been discovered in Queensland, New South Wales, and Tasmania.

Tin-stone.— Tin-stone (or peroxide of tin) is the only ore used for obtaining metallic tin. It is found disseminated throughout the alluvium of the valleys, or in lodes at considerable depths beneath the surface; the former deposits yield what is called stream-tin, while from the latter mine-tin is obtained. The first process to which the ore is subjected is grinding. The ground ore is then washed, which removes the impurities; for the specific gravity is so high that it is easy to wash away the earthy matter, and even some of the foreign metallic ores with which it is often mingled. But there are other bodies so nearly of the same specific gravity of the tin ore that they cannot be thus removed. The ore is then roasted in a reverberatory furnace, whereby the sulphur and arsenic are expelled. The ore, thus freed as much as possible from foreign matter, is mixed with the requisite fuel and limestone, and heated strongly in a reverberatory furnace, so as to bring the whole into the state of fusion, which is kept up for about eight hours. The lime unites with the earthy matters still mixed with the ore and flows with them into a liquid slag, while the coal reduces the oxide of tin to the metallic state. The reduced tin falls by its own weight to the bottom, and is, at the end of about eight hours, let out by tapping a hole in the furnace which had been filled with clay.

Refining Process.— The tin thus obtained is still very impure; it contains generally iron, copper, arsenic, and tungsten. In order to purify it the blocks of tin are placed in a reverberatory furnace and moderately heated until the tin melts and flows into the refining basins, while the greater part of the foreign metals remains in the solid state. The molten tin in the refining basins is then stirred with pieces of green wood, whereby gases are given off, and the metal is maintained in a state of artificial ebullition. The upper parts of the contents of the basin are oxidized and removed from the surface, while the greater part of the foreign metals collects at the bottom. The metal is allowed to partially cool, during which process it separates into zones, the upper consisting of nearly pure tin, while the under is so impure that it must be returned to the furnace and again melted. The upper layer of tin is removed into molds, containing each about 3 cwts., in which it is allowed to solidify; it is then sent into the market as block-tin, the purest specimens being called refined tin.

Characteristics.— Tin, when pure, has a fine white color like silver, and when fresh its brilliancy is great. It has a slightly disagreeable taste, and emits a peculiar smell when rubbed. Its hardness is between that of gold and lead. Specific gravity, 7.28. It is very malleable; tin-leaf, or tin-foil, as it is called, is about $\frac{1}{1000}$ part of an inch thick; and it might be beat out into leaves as thin again, if such were wanted

for the purposes of art. Its ductility and tenacity are much inferior to those of most of the metals known in early times; a bar of tin a quarter of an inch in diameter will not support a greater weight than 294 pounds. Tin is very flexible, and produces, while bending, a remarkable crackling noise. It melts at about 230° C. When cooled slowly it may be obtained crystallized in the form of a rhomboidal prism. By washing the surface of a mass of tin with warm dilute aqua regia it becomes covered with a number of crystals, which, from their unequal action upon light, give an appearance to the metal somewhat resembling that of watered silk. After a short exposure to the air tin loses its lustre and assumes a grayish-black color, but undergoes no further alteration. Neither is it sensibly altered by being kept under water. When tin is melted in an open vessel its surface becomes very soon covered with a gray powder, which is an oxide of the metal. If the heat be continued the color of the powder gradually changes, and at last it becomes yellow.

Tin Ores.—These are but two in number, tin ore and tin pyrites. The first of these occurs crystallized, and in a great variety of forms, which may all be derived from an octahedron with a square base, the angle over the apex being 112° 10′. The majority of the crystals have the general figure of a right square prism, with four-sided pyramids at each extremity. The cleavages take place parallel with the sides of this prism, and with both its diagonals. The crystals may be cleaved also parallel to the sides of the above-named octahedron, but with difficulty. The prisms are sometimes vertically streaked. Lustre adamantine; color various shades of white, gray, yellow, red, brown, and black; streak pale gray, in some varieties pale brown; semi-transparent, sometimes almost transparent, and in others opaque; brittle; hardness about that of feldspar, specific gravity, 6.96. Tin ore presents itself in a great variety of compound or macled crystals. It also occurs reniform, rarely in botryoidal shapes, and massive, with a granular or columnar composition, the individuals being strongly connected and the fracture uneven. The wood-tin of the Cornish mines is a mere variety of tin ore. The following ingredients were found in a specimen of crystallized and in a massive tin ore:—

	Crystallized	Massive
Oxide of tin	99.00	95.00
Oxide of iron	0.25	5.00
Silica	0.75	0.00

In its greatest purity it contains nothing but oxide of tin. Alone it does not melt before the blowpipe, but is reducible when in contact with charcoal. It occurs disseminated through granite, also in beds and veins. It also occurs in pebbles, and is extracted in this shape from stream-works. The variety called wood-tin has hitherto been found only in these repositories. Tin pyrites, the other ore of tin, occurs massive, with a granular composition; fracture uneven, imperfectly conchoidal; lustre metallic; color steel-gray, inclining to yellow; streak black; opaque; brittle; hardness about that of fluor-spar; specific gravity, 4.35. Before the blowpipe sulphur is driven off, and the mineral melts into a blackish scoria, without yielding a metallic button. It is soluble in nitro-muriatic acid, with precipitation of part of the sulphur. It contains from 14 to 30 per cent of tin. It is found at Saint Agnes in Cornwall, in Saxony, and in Bolivia.

Statistics.—During 1902 and 1903 the production of tin, as estimated upon the basis of trade statistics, was as follows, in long tons:

	1902	1903
Straits (Malay Peninsula)	54,062	54,797
Australia	3,500	4,991
Banka	14,978	15,070
Billiton	3,951	3,653
Bolivia	9,000	9,500
Cornwall, England	4,392	4,150
Miscellaneous	350	375
Total	90,233	92,536

The consumption of this tin is distributed about as follows: United States, 43 per cent; Great Britain, 28 per cent; other European countries, 22 per cent; India, China, etc., 7 per cent.

The reports of the Bureau of Statistics show that the imports of tin into the United States for 1902 and 1903 were as follows, in long tons:

	1902	1903
Straits	18,003	17,666
Australia	262	222
Great Britain	14,633	16,091
Holland	1,429	1,046
Other Europe	475	374
Other countries	76	46
Total	34,878	35,445

The production of tin for several years has hardly exceeded the consumption, and from some of the older districts there are signs of a diminution in output. New sources of supply are much needed, but the exploration, which has been constantly carried on, has not been successful.

Tin Horn War. See UNITED STATES, WARS OF THE.

Tin-mouth, a fish. See CRAPPIE.

Tin Plate, Manufacture of. The manufacture of tin plate was probably begun in Bohemia, about the beginning of the 16th century, and was first attempted in England about 1670. The methods at that time were crude, and consisted of the simple expedient of dipping the plates into a vat of molten tin and allowing the surplus metal to drain off. It was some time before any improvement in the methods was made, but in 1865 Mr. Morewood, of South Wales, England, invented a machine which gave tin plate manufacture its start and placed the industry on a paying basis by greatly reducing the cost of production. At the surface of the pot he placed a pair of steel rods which seized the plate as it came up and rolled off the superfluous tin; thus leaving the coating of the plate smooth and even. Since then many improvements have been made in the methods of manufacture, making the product more serviceable and reducing materially the manufacturing expenses. The modern method is as follows:

After the bars of steel have reached the

rolling mill they are first cut into accurate lengths, then placed into the sheet mill furnace, brought to a cherry-red heat, taken out in pairs, and given three or four passes through roughing rolls, each bar being fed through sidewise and rolled singly. After cooling they are again heated, placed one upon the other, and in pairs are again rolled. The doubler then grasps the plates at one end with a pair of large tongs and brings the two ends together. The loose ends are then shorn off square, and the fold is flattened by means of a powerful press, thus making four thicknesses or plates, one end of each being free, the other still forming the bend. The plates are again heated, passed through the roughing rolls, taken by the doubler, opened back to the bend, and once more doubled. The first bend is snipped off when the ends are squared, thus making one free end for each sheet in the pack. This is done to prevent buckling and to insure a perfect finished plate. They are then heated for the fourth time, passed two or three times more through the finishing rolls, and are then ready for the pickler.

After the sheets have been separated and examined for possible flaws, they are sent to the black pickler, where they are immersed in a strong solution of acid and hot water to remove all dirt, after which they are rinsed and allowed to drain. All perfect plates, in order to make them sufficiently soft for general use, are sent to the annealing furnace, which opens the pores and toughens the plate. After being heated there thoroughly for a period of about 12 hours, the plates are cooled off, and carried to the cold rolls through which they are passed singly. The re-squarer then trims the four edges, and restacks the plates in the annealing box; they are again annealed and put into the white pickler, in which the acid solution is much weaker than in the first bath.

Having been pickled and rinsed, the plates are placed in water boshes; immersed in a bath of melted palm-oil; placed in a pot containing molten tin and lead; and finally dipped into another pot of tin of lower temperature than the previous one. From the tinning pot they are put into the grease pot, the thickness of the coating being determined by the length of time they remain therein. After cooling they are cleaned by passing through bran and dust. This completes the process and the plates are ready for the market.

According to the census of 1900 there were in the United States 57 establishments engaged in the manufacture of tin plate, employing $6,650,047 capital and 4,004 persons; paying $2,181,240 for wages and $26,728,150 for materials; and having an aggregate output valued at $31,892,011.

Tin Wedding. See WEDDING.

Tin'amous, a group of South American game-birds, the *Crypturi,* called "partridges" by European colonists because of their superficial likeness to those birds, but structurally occupying a distinct place, the determination of which has greatly puzzled ornithologists. The view now prevails that they are a "very distinct group of birds, which, though not to be removed from the *Carinatæ* present so much resemblance to the *Ratitæ* as to indicate them to be the bond of union between those two great divisions. Many genera and species are known in southern South America, and two or three forms extend northward into Mexico. They vary in size from that of a quail to that of a guinea hen. The head is small, neck slender, bill elongated, and plumage close and inconspicuous, usually brownish or bluish, with few ornamental markings. The wings are short and rounded and the tail so short and soft as in some species to appear absent altogether. Some of them inhabit forests and others more open country, and show very little skill or courage in avoiding the gun or escaping capture. Their flesh is delicious. They nest upon the ground and lay very remarkable eggs, since the shell "looks as if it were of highly burnished metal or glazed procelain, presenting also various colors, which seem to be constant in the particular species, from pale primrose to sage-green, or light indigo, or from chocolate brown to pink-orange." The fact that the male alone incubates the eggs is one of many ratite characteristics of this antique and curious group of birds. Consult Newton, 'Dictionary of Birds' (New York 1896) wherein will be found many references to special authorities.

Tincal, or Tinkal, a common trade name for borax (q.v.) in the crude state.

Tincker, Mary Agnes, American novelist: b. Ellsworth, Maine, 18 July 1833. In her earlier days she taught in a Roman Catholic parochial school, and from 1873 to 1887 lived in Italy. Her best known novel is 'Signor Monaldini's Niece' (1878); and later fictions by her include 'By the Tiber' (1881); 'The Jewel in the Lotus' (1884); 'Aurora' (1885).

Tincture, in pharmacy, an alcoholic solution of some medicinal substance, prepared by digestion, maceration, or percolation. They may be a solution of some chemical element as iodine, of some single chemical compound as chloride of iron, or a solution of that part of some plant which will dissolve in the solvent used: example, tincture of cinchona bark. Simple tinctures are those obtained from a single drug, compound tinctures from many. The solvents (*menstrua*) are various; pure alcohol, mixtures of alcohol and water or of alcohol and ether, alcoholic solutions containing ammonia, etc.

Tin'dal, Matthew, English controversialist: b. Beer Ferris, in Devonshire, about 1653; d. 1733. He was graduated from Lincoln College, Oxford, in 1676, in 1678 was elected a fellow of All Souls' College, and afterward became a Doctor of Civil Law, and an advocate of Doctor's Commons. In the reign of James II. he turned Roman Catholic, but in 1688 returned to the Church of England. He published several pieces, political and theological, among which were a 'Letter to the Clergymen of the two Universities, on the subject of the Trinity and Athanasian Creed,' and a treatise, 'The Rights of the Christian Church asserted against Priests' (1706). This work excited a sensation among the high church clergy, who attacked it with great animosity. Tindal published two defenses of it, which the House of Commons ordered to to be burned by the common hangman, with the original treatise. In 1730 he published his 'Christianity as Old as the Creation, or the Gospel a Republication of the Religion of Nature,' in which his object was to show that there cannot be any revelation distinct from the inter-

nal revelation of the law of nature in the hearts of mankind. This deistical or rationalist work — by which his name is chiefly known — received a great many answers.

Tin'dall, or Tyndale, William, English reformer and translator of the Bible: b. near Welsh borders about 1490; d. Vilvoorden, Belgium, 6 Aug. 1536. He entered the University of Oxford in 1510, and was graduated in 1512. He subsequently went to Cambridge, where he resided till 1521, and about this latter date became tutor to the children of Sir John Walsh, a landed gentleman in Gloucestershire. He preached with great acceptance in the neighborhood, but soon got into trouble owing to his unorthodox views. In 1523 he went to London, where he came under the influence of Luther's teaching. It was at this time that he began his translation of the New Testament, but finding it unsafe to carry out such a work in England, he went to Hamburg in 1524, and immediately afterward to Luther at Wittenberg, where he remained till April 1525. During this time he was proceeding with his translation, with the assistance of one William Roy, and the printing of it was begun at Cologne in 1525. A Roman Catholic clergyman, John Cochlæus, came to know of this, and obtained an injunction ordering the stoppage of the work, whereupon Tindall went to Worms and had the work printed there. It was smuggled into England in 1526, and at once Archbishop Warham and Bishop Tunstall took the lead in seizing and burning copies. Attempts were also made to get hold of Tindall, but he fled to Marburg, where he enjoyed the protection of the landgrave of Hesse. Here he became a Zwinglian in his attitude on the Eucharist, and published some of his most important original works, including 'The Parable of the Wicked Mammon' (1528); 'The Obedience of a Christian Man,' and 'How Christian Rulers ought to Govern' (1528); and 'The Practyse of Prelates' (1530). He also engaged in a vigorous polemic with Sir Thomas More. From Marburg he went to the Netherlands, and for several years resided in Antwerp, but toward 1533 left the city for a time, owing to Henry VIII.'s efforts to seize him. In 1535 he was captured at Antwerp by the imperial officers, assisted by an English Roman Catholic student named Phillips who professed to adopt his reforming opinions. He was lodged in the state prison at Vilvoorden, near Brussels, and despite some efforts to save him, made by Cromwell and others, he was tried for heresy, condemned, degraded from holy orders, then strangled and his body burned. A fragment of the interrupted Cologne print of his New Testament translation is in the British Museum, and there are two extant copies of the first edition of his complete New Testament (1525), one (practically complete) in the Baptist College, Bristol, the other (incomplete) in Saint Paul's Cathedral. A revised edition was issued by him at Antwerp in 1534, and a further revision in the following year. His translation of the Pentateuch appeared at Marburg in 1529–30, and that of Jonah at Antwerp in 1531; a copy of each is in the British Museum. Tindall's translation is of much importance in the history of English style and English literature, and formed the basis, as far as it went, of the Authorized Version of nearly a century later. There is an edition of Tindall's original works by the Parker Society (three vols. 1848–50). Consult: Demaus, 'Life of William Tindall' (1886).

Tinder, a dry substance that readily ignites from a spark. Specifically, tinder, before the introduction of friction matches, was in common use as a means of starting a fire. It consisted usually of charred linen which caught the spark from a flint and steel; since the tinder did not flame, the fire was started by touching a match dipped in sulphur to the ignited tinder. "German tinder" or amadou consisted of the more solid portions of certain fungi, mainly tree-growing polyfores, prepared by boiling in water and drying. Sometimes saltpetre, or even a little gunpowder, is added. Amadou has been used to stop bleeding, and also in surgery as a support, and for pressure and protection. "Spanish tinder" was a stuff prepared from the pubescence of the flower-heads, stems, and leaves of globe-thistle. The use of the word tinder has been extended to denote any substance easily inflammable. Tinder-boxes were boxes in which tinder was kept ready for use; they were usually provided with a flint and steel, the latter often fastened to the cover of the box in such a manner that the flint when struck against it sent sparks into the tinder within.

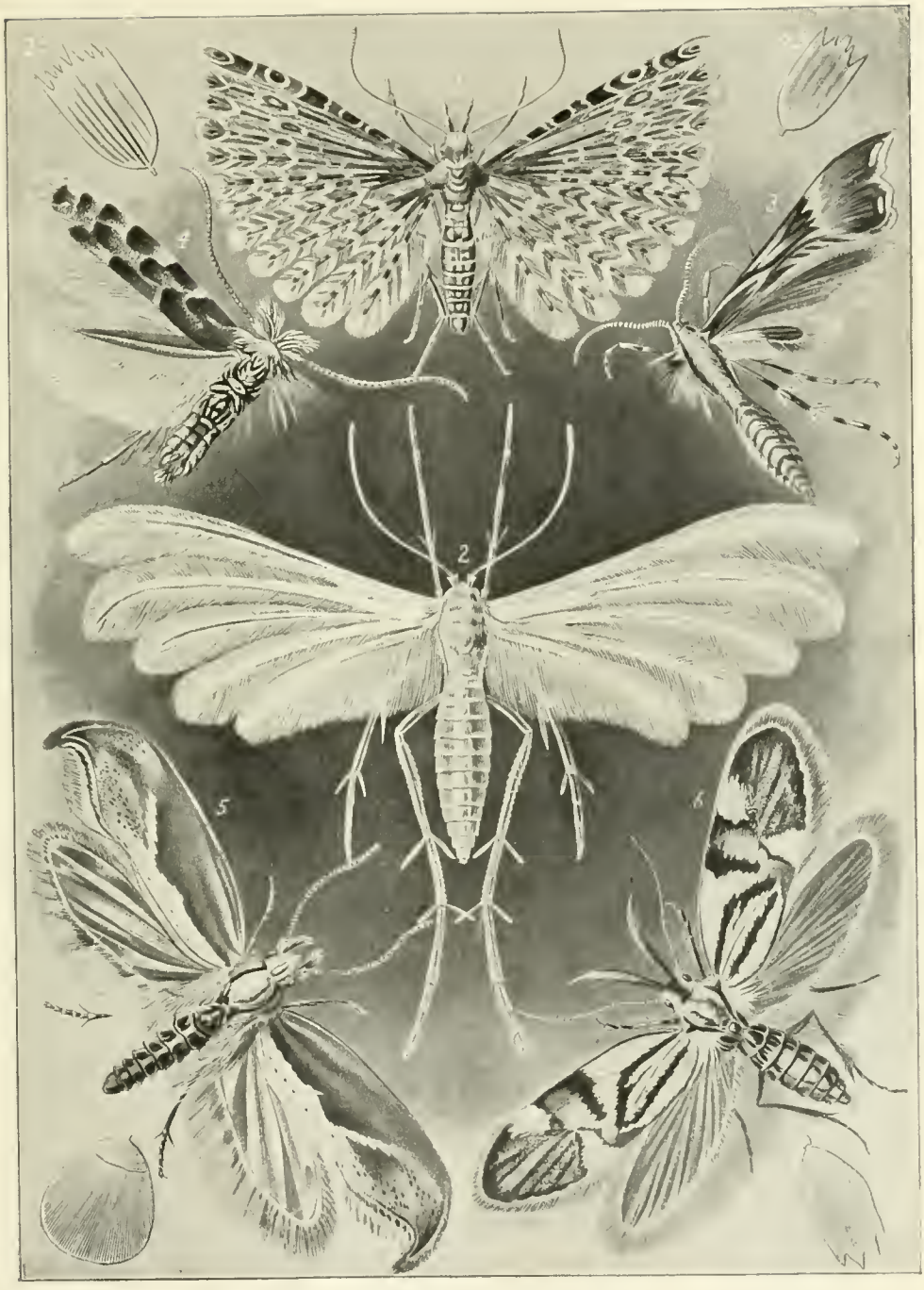
Tine'idæ, a family of moths, prominently represented by several small species whose caterpillars are destructive to woolen fabrics, furs and various stored products. See CLOTHES-MOTH; FLOUR AND MEAL INSECTS; GRAIN INSECTS; MOTHS; etc.

Tinoceras, tī-nŏs'ē-ras, a genus of mammals now extinct, found in the Eocene of Wyoming (Bridger beds) and representing the order *Dinocerata* (q.v.). The individuals were all large, some of them nearly equaling the elephants, and differed little from, if, indeed, they were not identical with, *Uintatherium* (q.v.).

Tinos, tē'nŏs, or **Tenos**, tē'nŏs, Greece, an island in the nomarchy of the Cyclades, immediately southeast of Andros. It is 18 miles long by eight miles broad, and has an area of 81 square miles. It is traversed by high mountains, the terraced slopes of which yield wine, wheat, melons, figs, etc. Block marble and wrought marble in a variety of vessels and ornaments, silk and silk goods are the chief exports. Tenos or Hagios Nikolaos, the chief town, on the south coast, is the see of a Roman Catholic bishop, has two Roman Catholic churches, and a small harbor. North of the town is the white marble church of Penagia Evangelistria, a famous pilgrim resort. Excavations in 1902 on the site of ancient Tenos revealed remains of the Temple of Poseidon. Tenos was prominent in the wars with the Persians, and during the Greek Revolution 1821–7. Pop. 12,000.

Tin'tern Abbey, England, a ruin of unrivaled beauty in Monmouthshire, on the Wye, eight miles south of Monmouth. It was founded in 1131 by the Cistercian monks — the church in 1287. It is well preserved and is a noble specimen of the transition from Early English to the Decorated. The open work of the windows is one of its chief beauties. Under Henry VIII. the abbey was dismantled and its lands bestowed upon the Earl of Worcester.

Tintoretto, tēn-tō-ret'tō, **Jacopo Robusti**, son of a dyer (Italian, *tintore*), whence his usual



TINEID MOTHS (much magnified).

[1], [2], [3] Feathered Moths. [4], [5], [6] Common Moths. Other figures are details of the scales.

surname, Italian painter: b. Venice 16 Sept. 1518; d. there 31 May 1594. He was a pupil of Titian, but was soon dismissed by his master, perhaps through fear of rivalry. He thereupon worked without a master, taking as his ideal in painting a union of the design of Michelangelo with the coloring of Titian. He painted with such extraordinary facility and rapidity as to gain the epithet "Il Furioso." Annibale Carracci said that he was sometimes equal to Titian, often inferior to Tintoretto. He treated Scripture subjects in a perfectly naturalistic spirit, but at times this became decidedly coarse. Ruskin estimates Tintoretto very highly, and places him among the supreme painters. The greater number of his works are to be found in his native city, and of these the following may be named: In the Palace of the Doges: 'Paradise,' the largest oil-painting in the world, with a very large number of figures; 'The Delivery of the Doge's Insignia to Niccolò da Ponte'; 'Recapture of Zara'; 'Forge of Vulcan'; 'Mercury with the Graces'; 'Minerva driving back Mars'; 'Descent from the Cross'; etc. In the Academy: 'St. Mark descending to the Rescue of a Condemned Christian Slave'; 'Adoration of the Kings'; etc. In the church of Madonna dell' Orto: 'The Last Judgment'; 'Adoration of the Golden Calf'; 'Miracle of St. Agnes,' and 'Presentation in the Temple.' The Uffizi gallery at Florence contains some of his works, including 'Abraham's Sacrifice' and a 'Marriage at Cana'; and the Pitti Palace contains, among others, a 'Descent from the Cross'; 'Vulcan with Venus and Cupid,' and a 'Madonna.' The Prado Museum at Madrid is rich in works by Tintoretto, among them being many portraits; and others are to be seen in the National Gallery at London ('St. George Destroying the Dragon'; 'Christ Washing the Feet of His Disciples'), Berlin, Dresden, Vienna, Paris, etc. Consult: Ruskin, 'Stones of Venice'; 'Modern Painters'; etc.; Osler, 'Tintoretto' (1879); Stearns, 'Jacopo Robusti' (1895).

Tin'worth, George, English sculptor: b. London, England, 5 Nov. 1843. He was the son of a wheelwright, and in his father's shop began the practice of wood carving. In 1861 he took lessons in an art school at Lambeth, and in 1864 entered the Royal Academy schools. After exhibiting figures and groups of figures at the Royal Academy, he obtained an appointment in the Doulton art pottery (1867). The productions by which he became famous were mainly terra-cotta panels with groups of figures in high relief illustrating scenes from sacred history, which combine originality of design, with dramatic effectiveness, and devout feeling. His most important work is the reredos in York Minster, with 28 terra-cotta panels.

Tionontaic, an American Indian tribe formerly residing near Nottawasaga Bay, Ontario, Canada. When first discovered by the French in 1616, they were called the Tobacco Nation, from their large fields of tobacco. In 1670, the remnants of the tribe joined the Wyandottes (q.v.).

Tippecanoe, a nickname of General William Henry Harrison, given to him on account of his victory in the battle of Tippecanoe (q.v.). In the presidential campaign of 1840, which resulted in the election of Harrison and Tyler, "Tippecanoe and Tyler too" was the party war-cry of the Whigs.

Tippecanoe, Battle of, fought 7 Nov. 1811 near the site of the present village of Battle Ground, on the Tippecanoe River, in Tippecanoe County, Ind., between about 900 Americans under William Henry Harrison (q.v.), who was then governor of the Territory of Indiana, and a force of Indians nominally under "the Prophet," brother of Tecumseh (q.v.), but actually commanded by three chiefs, Stone Eater, White Loon, and Winnemac. The Indians were estimated by Harrison at about 6,000, but were probably much less in number. Harrison encamped on the night of 6 November near the Indian village on the Tippecanoe River, and while his men were asleep in the early morning of the 7th the Indians fell upon them with great fury, and were only defeated and driven from the field after several hours of desperate fighting, in which the whites lost about 185 in killed and wounded, the loss of the Indians being unknown, though they left 40 dead on the field. The village was found on the 8th deserted, and was burned by Harrison's men. For reasons of prudence Harrison then fell back to Vincennes. Consult: Pirtle, 'The Battle of Tippecanoe' (1900), No. 15 of the "Filson Club Publications."

Tipperary, tĭp-ĕ-rā'rĭ, Ireland, a town and the county-seat of Tipperary County in Munster, situated 42 miles northwest of Cork. It has a large grammar school, and butter and provision markets. Pop. (1901) 6,281.

Tippoo Sahib, tĭ-poo' sä'hĭb, sultan of Mysore: b. 19 Nov. 1749; d. Seringapatam, Mysore, 4 May 1799. He was the son of Hyder Ali Khan, whom he succeeded in 1782. During the operations of the English troops under General Mathews in Malabar, he checked the advance of the British at Bednor, April 1783, and temporarily wrested Mangalore from its western invaders. In the following autumn he was compelled to surrender this province to Great Britain. In 1784 he was forced to sign a treaty of peace; but, continuing to intrigue, war was declared against him in 1790 and in 1791 he was defeated by Lord Cornwallis and obliged to surrender half of his domain, and to pay 33,000,000 rupees to his English conquerors. In 1799 he was suspected of an alliance with France, and again defeated by the British and their allies, the Mahrattas. He was killed while fighting in this campaign. Consult: Bowring, 'Haider Ali and Tipu Sultan' (1893).

Tip'ton, England, town in Staffordshire, situated six miles northwest of Birmingham. It has coral and iron mines, iron foundries, steam boiler and structural iron works, and red and white lead factories. Pop. (1901) 30,543.

Tipu'lidæ, the family of craneflies (q.v.).

Tiraboschi, tē-rä-bŏs'kē, **Girolamo,** Italian literary historian: b. Bergamo 28 Dec. 1731; d. Modena 3 July 1794. He was educated by the Jesuits, afterward joining their order, and was for many years a professor in the University of Milan. He was a scholar of note, his greatest work being the 'Storia della Letteratura Italiana' (1772–93) in 13 volumes. He also published 'Biblioteca Modenese' (6 vols. 1781–6);

and 'Memorie storiche modenesi' (1793–4). He was librarian to Francis III., duke of Modena, from 1770.

Tirailleur, tĭ-rä-lyėr, a skirmisher, sharp-shooter; the title was first employed by the French, in 1792, to denote light-armed troops thrown out from the main body to do skirmish work, feel the enemy, cover the movement of the main body, etc.

Tiraspol, tē-räs-poly', Russia, a river-port in the government of Cherson, on the Dniester, 60 miles northwest of Odessa. It possesses five churches, two synagogues, and a state bank. One of its chief attractions is its gardens. The principal industries are tobacco-raising and fruit culture. There are four factories and some trade is carried on. Pop. (1897) 27,585.

Tire, the band placed around the fellies of a wheel, is commonly made of metal or of rubber. Metal tires were formerly made in sections and were bolted to the wheel in such a way as to "break joints" with the fellies, and this style of tire has only recently been abandoned in Europe. The continuous steel tire is an American invention and consists of a flat hoop of steel of the same width and circumference as the fellies; it is expanded by heating and put on in a heated condition; upon cooling it shrinks and tightly compresses the wheel. It is further secured by sunk-bolts through the fellies. Recent progress in wheel building has made the use of rubber tires very general, their advantage over metal tires being in increase of tractive adherence and decrease of jar on the vehicle. Rubber tires always have rounded contact surfaces and are generally tubular in shape. They are of three principal kinds — solid rubber; those with central air spaces; and pneumatic tires. The rim of the felly is usually concave in order to fit the rubber tire more snugly, and is frequently cased with a thin sheet of metal. The tire is fastened to the felly by cement, lacings, etc. In the case of pneumatic tires, where there is an air-tight elastic tube contained within a tough outer sectional one often the distention of the inner tube is made to automatically clinch the tire to the fellies.

Tire'buck, William Edwards, English novelist: b. Liverpool 1854. He was for some years a writer on the staff of the Liverpool 'Mail,' and the 'Yorkshire Post,' but in 1888 retired from newspaper life and devoted himself to writing fiction. His best known novels include: 'Saint Margaret' (1888); 'Dorrie' (1891), and 'Miss Grace of All Souls' (1895). He is also the author of an estimate of 'Dante Gabriel Rosetti' (1882), and of a later work entitled 'Great Minds in Art' (1888); etc.

Tiresias, tī-rē'sĭ-as, according to Greek mythology, a soothsayer of Thebes, reputed to have been struck blind either because he had revealed to men things which they ought to know, or because he had seen Athene bathing. Athene conferred upon him the power to understand the language of birds, while Zeus gave him the gift of prophecy and long life. Tennyson has a poem on the subject of 'Tiresias' (1885), who also figures in many Greek legends.

Tiryns, tī'rĭnz, Greece, in Argolis, 10 miles southeast of Mycenæ, an ancient city on a rocky height which formed the Acropolis; beneath which another city extended along the plain. The town was destroyed 468 A.D. Much of the citadel and of the cyclopean walls with their pointed gates are still standing, together with some interior passages or galleries of similar construction. The excavations conducted by Schliemann in 1884–5, resulted in the discovery of a magnificent palace, comprising various buildings, and approached by a peristyle. The complete arrangement of public halls and private apartments is apparent. Consult Schliemann, 'Tiryns' (1886), and Perrot and Chipiez, 'Histoire de l'Art dans l'Antiquité' (Vol. VI. 1894).

Tischbein, tĭsh-bīn, Johann Friedrich August, German painter: b. Maestricht 1750; d. Heidelberg 1812. He studied with Johann Heinrich Tischbein, and in Paris and Italy. After serving as court painter in Waldeck he became director of the Leipsic Academy in 1800. He painted many noteworthy portraits, including nine of the princes and princesses of Orange-Nassau (Amsterdam) and that of Schiller, which he finished in 1804.

Tischbein, Johann Heinrich, German painter: b. Haina 3 Oct. 1722; d. Cassel 22 Aug. 1789. He studied under the court painter Freese in his native town, and under Boucher, Van Loo, and Watteau in Paris. He entered the studio of Piazzetta in Venice 1748, returned to Cassel in 1751, was made court painter to the landgrave, and in 1776 became director of the New Academy. He painted numerous portraits and historical pictures, which, although not possessing great strength, were considered among the best produced in Germany at that period. Among them may be mentioned: 'Lessing' (1760); 'Count Waldner von Freundstein' (1761); 'Augustus and Cleopatra' (1769); and 'Belisarius' (1786).

Tischbein, Johann Heinrich Wilhelm, German painter and etcher, called "the Neapolitan": b. Haina 15 Feb. 1751; d. Eutin 26 July 1829. He was a nephew of Johann Heinrich Tischbein, and the most famous of the Tischbein family. He studied under his uncle and other relatives, and in Hamburg, Bremen, and Holland. Goethe assisted him in going to Italy, and in 1787 the two went together to Naples, where Tischbein enjoyed the patronage of Sir William Hamilton, and from 1789 to 1799 was director of the Academy. In 1809 he became court painter to the Duke of Oldenburg. The 43 'Idyls' celebrated in Goethe's verse were painted by Tischbein at Eutin. To different publications he contributed over 150 etchings and engravings, and his paintings include 'Conradin of Swabia Hearing his Sentence' (1784); 'An Italian Landscape' (1819); a portrait of Goethe; and a portrait of the artist himself. Consult Michel, 'Etude biographique sur les Tischbeins' (1881).

Tischendorf, tĭsh'ĕn-dŏrf, Konstantin von, German biblical critic: b. Lengenfeld, Saxony, 18 Jan. 1815; d. Leipsic 7 Dec. 1874. He was educated at Leipsic, where he qualified as a lecturer in 1840. In the latter year he went to Paris and deciphered the 'Codex Ephræmi,' and soon afterward he began to travel extensively in Europe, Egypt, Sinai, and Palestine in search of biblical manuscripts. In 1844 he saved from the flames in the Convent of St. Catharine on Mount Sinai a valuable manuscript of the Old

Testament, but failed to get possession of more than a part of it. This part he published in facsimile in 1846 as the 'Codex Friderico-Augustanus,' so named in honor of his patron, the King of Saxony. He was appointed in 1845 extraordinary professor, in 1850 ordinary honorary professor, and in 1859 ordinary professor of theology and biblical palæography at Leipsic. He again visited the East in 1853, and in 1859 he made a third visit at the cost of the Russian government. On the third journey to Sinai he brought back the rest of his 'Codex Friderico-Augustanus,' better known as the 'Codex Sinaiticus,' the oldest Greek manuscript of the Bible, containing the entire New Testament and the Epistle of Barnabas, besides much of the Old Testament. (See Codex Sinaiticus.) A magnificent facsimile edition was published in four volumes at Saint Petersburg in 1862. In 1869 Tischendorf was ennobled by the emperor. Among his contributions to the textual criticism of the New and the Greek Old Testament are the following editions: 'Codex Ephræmi Syri' (1843); 'Codex Friderico-Augustanus' (1846); 'Monumenta Sacra Inedita' (1846); 'Evangelium Palatinum Ineditum' (1847); 'Codex Amiatinus' (1850); 'Codex Claromontanus' (1852); 'Novum Testamentum Vaticanum' (1867); 'Appendix Codicum celeberrimorum Sinaitici Vaticani Alexandrini' (1867); and 'Monumenta Sacra Inedita: Nova Collectio' (1855–70). He issued several editions of the Greek New Testament, of which the 8th critical edition (two vols., 1864–72) is of great importance. In his 'Novum Testamentum Triglottum' (1854) he printed together his Greek text, the Latin of Jerome, and the German of Luther. His 'Synopsis Evangelica' (5th ed. 1854) should also be mentioned in connection with this part of his work. He edited the Septuagint with critical appendix (1850; 7th ed. 1887), and on the New Testament apocrypha and pseudepigrapha published: 'De Evangeliorum Apocryphorum, Origine et Usu' (1851); 'Acta Apostolorum Apocrypha' (1851); 'Evangelia Apocrypha' (1853); and 'Apocalypses Apocryphæ' (1866). 'In wann wurden unsere Evangelien verfasst?' (1865; Eng. trans.) he shows a strongly conservative tendency. He described his travels in the works 'Reise in den Orient' (1845–6) and 'Aus dem Heiligen Lande' (1862).

Tish'ri, a month in the Jewish calendar, the first of the civil year and the seventh of the ecclesiastical. It corresponds to portions of our September and October, and contains the Jewish Day of Atonement as well as the Feast of Tabernacles. It is frequently mentioned in the Old Testament and in 1 Kings viii. 2 it is related that ". . . all the men of Israel assembled themselves unto King Solomon at the feast in the month Ethanim, which is the seventh month"; the term Ethanim, used instead of Tishri, signifies streaming rivers, the result of the September floods. The name tishri occurs in the Palmyrene inscriptions, and therefore was probably not confined to the Jews.

Tissandier, tē-sän-dē-ā, **Gaston,** French aeronaut: b. Paris, France, 21 Nov. 1843. He was the inventor of a dirigible balloon in which he made an ascent of 5½ miles from Paris in 1875; he alone surviving of the members of the aeronautic experiment. Besides his written contributions to the subject of aeronautics he has contributed to the 'Library of Wonders' series, well known volumes on the subjects of light, water, coal, and fossils.

Tissot, tē-sō, **Claude Joseph,** French philosopher: b. Fourgs (Doubs), 26 Nov. 1801; d. Dijon 7 Oct. 1876. He translated the larger part of Kant's writings into French. Among his original works are: 'Of the Beautiful, Especially in Literature' (1830); 'Short History of Philosophy' (1840); 'The Mania of Suicide and of Revolt' (1840); 'Parceling of the Land and Division of Property' (1842); 'Principles of Morality' (1866); 'Catholicism and Public Instruction' (1874); 'Insanity Considered Especially in its Relations to Normal Psychology' (1876).

Tissot, James, French painter: b. Nantes 15 Oct. 1836; d. Abbey of Bouillon 8 Aug. 1902. He was a pupil of Ingres, studied in London under Seymour Haden, and attracted attention by his brilliant pictures of fashionable women, actresses and grisettes, as in his 'Promenade in the Snow' (1859). His series of etchings 'Parisian Women' was very popular. He suddenly changed his whole artistic aim in life under the stress of a sudden bereavement and went to Palestine (1890) where he studied for six years the scenery and buildings and rural activities of the Holy Land for the purpose of producing a set of pictures illustrating the life of Christ. These paintings were subsequently reproduced by Lemercier in Paris under the title 'La Vie de notre Seigneur Jésus-Christ'; and a parallel publication of them has been issued in this country. The original drawings and paintings, 540 in all, are now in the Brooklyn Institute of Art, having been purchased from the artist for $60,000.

Tissue, a group of similar cells in a plant or animal body which form a definite fabric, having the same origin and discharging the same function. Tissues are classified according to their structure when completely developed, in accordance with their functions, or with reference to their mode or origin. A common classification of animal tissues includes cellular tissue (q.v.), connective tissue (q.v.), epithelial tissue (see Epithelium), muscular tissue (see Muscular System), nerve-tissue (see Nervous System), etc. Fatty tissue consists of a meshwork of white fibrous tissue in which fat-cells are imbedded. It is found beneath the skin, around various internal organs, in the marrow of bones, and elsewhere, and is both protective and heat-retaining in its function. Mucous tissue is merely a stage in the development of ordinary connective tissue. Adenoid tissue, found in the glands, consists of a network of very delicate connective tissue, in which white cells of various sizes are entangled. The cartilage (q.v.) or gristle of the joints is one of the primary animal tissues. See Anatomy, Comparative; Anatomy of Plants; Bone; Cartilage; Histology; Parenchyma.

Tissue Paper. See Paper and Paper-making.

Tisza, tĭs'ŏ, **Koloman Borosjeno von,** Hungarian statesman: b. Grosswardein 16 Dec. 1830; d. Budapest, Hungary, 23 March 1902. He was educated for the law, but entered the civil service in 1848, and took a prominent part in

educational affairs. Although not at first identified with the revolutionary movement, the attempt of Austria to control ecclesiastical matters in Hungary in 1859 brought him forward as the leader of the party which stood for Protestant autonomy. In 1860 he was elected to the Hungarian Parliament, where he opposed the conciliatory measures offered by the imperial government in the proposal to relinquish absolute authority and to yield the right of representation to the Magyar provinces, and stood resolutely and persistently for independence. In 1861 he succeeded Count Telsky as the leader of the Constitutional party. He was subsequently instrumental in uniting the moderate Radicals with the Liberal party, but was at all times opposed to the socialistic and agrarian demands of the revolutionists. In 1875 he was appointed minister of the interior, and some months later became prime minister. He resigned his office in 1890, but continued until his death to direct the affairs of his party and to control legislation.

Tita'nia, according to Ovid, a name of Latona, a daughter of the Titan Coius. Shakespeare in 'Midsummer Night's Dream,' gives the name to the wife of Oberon.

Titanif'erous Iron Ores are chiefly varieties of the minerals ilmenite, hematite and magnetite. Ilmenite (q.v.) is often called titanic iron ore and is richer in titanium than either of the others. The value of these ores for both iron and titanium, which was long questioned, seems at last to be established. The remarkable attraction of titanium for nitrogen suggests its use in freeing iron and steel of blow-holes, while titanium steel is known to possess remarkable toughness and tensile strength. Much excellent work has been done by Rossi in pointing out the merits of titanium steel and in developing processes for the reduction of titaniferous iron ores. The most important known occurrences of these ores are in Norway, Quebec and the Adirondack Mountains, in each of which regions there are beds of vast extent. These occurrences have been exhaustively described in papers by F. J. Pope and Prof. J. T. Kemp.

Ti'tanite, a mineral occurring in monoclinic crystals, often wedge-shaped and twinned, having the composition of calcium silico-titanate. Its lustre is adamantine to resinous; hardness, 5 to 5.5; specific gravity about 3.5. Parting is often prominent, while prismatic cleavage is less distinct. Its colors vary greatly. Dark brown to black crystals, sometimes several inches in diameter, occur mostly in limestone in Saint Lawrence County, New York, and in Canada. The variety sphene is usually bright green or golden yellow, and often occurs in gneiss or chloritic schists in transparent or translucent twin crystals. Owing to the high refractive and dispersive power of such crystals, gems of rare beauty and inferior to none but the diamond in their play of colors, may be cut from them, though they lack durability owing to their low degree of hardness. The finest of these gem sphenes are from Switzerland, the Tyrol, Delaware County, Pennsylvania, and Tilly Foster, New York.

Titanosau'rus, a genus of huge sauropodous dinosaurs. See DINOSAURIA.

Titanothe'rium. See BRONTOTHERIUM.

Titans, tī'tanz, in Greek mythology, six sons and six daughters of Uranus and Ge, namely Oceanus, Koius, Krelius, Hyperion, Iapetus, and Kronus; Theia, Rhea, Themis, Mnemosyne, Phœbe, and Tethys. Uranus having banished to Tartarus the Hekatoncheires ("the hundred-handed") and the Cyclops, Gaia called the Titans to avenge their brothers. They rose and freed them, deposed Uranus, and set Kronus in his place. Kronus and the Titans were in their turn put down by the sons of Kronus and Rhea, named the Olympii, with Zeus at their head, but not till after a long struggle, in which Zeus brought to his aid the Cyclops and Hekatoncheires, whom Kronus had again imprisoned in Tartarus. Zeus quelled the Titans with the lightning given him by the Cyclops, hurled them to Tartarus, placing them under the care of the Hekatoncheires. This struggle, called the Titanomachia, was regarded as symbolic of the conflict of reason and order with the rude forces of nature. Consult: Mayer, 'Die Giganten und Titanen in der antiken Sage und Kunst' (1887).

Titchener, tĭch'ĕn-ẽr, Edward Bradford, American psychologist: b. Chichester, England, 11 Jan. 1867. He was graduated from Oxford in 1890, and afterward studied in Leipsic. He returned to Oxford as extension lecturer in biology, but was called to Cornell University, Ithaca, N. Y., in 1892, as assistant professor of psychology, and in 1895 became Sage professor of psychology there. His writings include 'A Primer of Psychology' (1898), and a later volume entitled, 'Experimental Psychology.' He is also an assistant editor of the 'American Journal of Psychology,' and a frequent contributor to its pages.

Tith'erington, Richard Handfield, American writer: b. Chester, England, 2 Oct. 1861. He was educated at Winchester and Magdalen colleges, Oxford, came to the United States in 1884, and is at present managing editor of 'Munsey's Magazine,' New York. He has published a 'History of the War with Spain' (1900).

Tithes, taxes, either voluntary or compulsory, consisting of one tenth of the subject taxed. Usually tithes were one tenth of the annual profit of the land and were paid for purposes of church support. The custom is of extreme antiquity. In Genesis xiv. 20, Abraham allows a tenth of the spoils taken from four kings to their victor. Moses allowed tithes for the support of the Levites and for service in the temple (Lev. xxvii., and Num. xviii.). In 778 Charlemagne commanded tithes to be collected within all the portions of the old Roman empire over which he ruled; this was for the support of the Christian Church. These tithes were by him allotted to four different uses: one part was for the maintenance of the edifice of the church, and the other three, severally, for the support of the bishop, the clergy, and the poor. Ecclesiastical tithes were always more or less oppressive in their operation, being unevenly imposed, but after their introduction into Great Britain they were systematized. They were first enjoined in England in 786 and in 794. Offa, king of Mercia, gave the Church all the tithes of his kingdom, and this law was subsequently made general for all England by Ethelwulf. When dioceses were divided into parishes the tithes of each parish were allotted to its minister,

at first by common consent, but afterward, about 1200, by the law of the land, and this law still holds good in England. The custom of paying tithes became established in Germany and France about the same time, the 9th century, and in the Scandinavian countries in the 11th century. At first the payment of the tax was always in kind, that is, in grain, live stock, wool, etc., and such tithes were known under three heads, namely, prædial, or those which arise immediately from the soil, as grain, fruits, and wood; mixed, or those consisting of natural products but nurtured by the care of man, as calves, lambs, eggs, cheeses, wool, etc.; and personal, or those arising from the profits of personal industry as in the pursuit of some profession, or some trade of livelihood. With regard to their value tithes were divided into great and small; great tithes being grain and wood, and belonging to the rector, and small tithes being the other prædial tithes with the mixed and the personal tithes, and belonging to the vicar.

Tithes proved a source of great trouble in every country in which they were collected and a constant cause of bickering between the clergy and the people. They have therefore been abandoned in nearly all countries except England, where they are still retained. There they have been the cause of constant friction between the people on the one hand and the officers of the law and the clergy on the other. Under Henry VIII. the owners of certain great estates were relieved of the duty and this increased the feeling of the tithe-payers that their burden was an unjust one. In three fourths of Ireland it was found impossible to collect tithes, for long periods at a time, and the enforcement of the law, especially in cases of non-members of the Church, was not infrequently accompanied by riot and revolt. Finally, an act of commutation was passed by which tithes were assessed in money, the value being based on the average price of corn for a preceding term of years. The matter has been the subject of much legislation by Parliament, which has generally established in lieu of the old system a fixed money rent charge payable annually. Consult for further information H. W. Clarke, 'History of Tithes' (1891); S. Degge, 'The Parson's Counsellor with the Law of Tithes' (1820); and J. Selden, 'History of Tithes' (1618).

Tithing, an old English subdivision of the population. It consisted of a company of about ten households, one of the integral parts of a hundred (see SHIRE), who were regarded as a distinct political division for some purposes of police and civil regulation. At its head was the tithing-man, who was directly responsible to the officers of the crown, the several members of the tithing being bound for the peaceable behavior of each other. The institution of the tithing has passed away, the tithing-man has evolved into the police constable, but in some parts of England British conservatism still preserves the name and the corresponding territorial distinction.

Tithing Man. See TOWN AND TOWN MEETINGS.

Tithonus, tĭ-thō′nŭs, a son, or nephew of Laomedon, king of Troy. He was beloved of Eos (Aurora, Morning), who induced Zeus to make him immortal. Her prayer was granted, but she had neglected to ask for perpetual youth, and in time her lover took on all the signs of extreme age. Tithonus prayed to the gods to be relieved of this "cruel immortality" and was metamorphosed into a grasshopper. Tennyson has written a remarkable poem, 'Tithonus,' on this mythological incident.

Titian, tĭsh′an, or **Tiziano Vecellio,** tēt-sē-ä′nō vā-chĕl′lē-ō, Italian painter: b. Capo del Cadore, in the Alps of Friuli 1477; d. Venice 27 Aug. 1576. His early studies were under Sebastiano Zuccati of Trevigi, and subsequently under Giovanni Bellini of Venice, and he had as a fellow pupil Giorgione. The first important work of Titian was the completion in 1512 of the unfinished picture by Giovanni Bellini, 'The Homage of Frederick Barbarossa to Pope Alexander III.,' in the Sala del Gran Consiglio at Venice. The senate, who had selected the young painter to finish his late master's work, were so pleased with its execution that they appointed him to an office with 300 crowns a year; but the terms of the appointment bound him to paint for eight crowns the portrait of every doge elected in his time. In 1514 he was employed at the court of Alphonso I., duke of Ferrara, where he became acquainted with Ariosto, whose portrait he painted. In 1516, shortly after his return to Venice, he painted an 'Assumption of the Virgin,' considered one of the finest pictures in the world; it is now in the Academy of the Fine Arts in Venice. His now rapidly increasing renown procured him invitations to Rome by Leo X. and to Paris by Francis I., neither of which he accepted. In 1528, or perhaps a year or two later, he produced his magnificent picture, 'The Death of St. Peter the Martyr'—"a painting," says Algarotti, "in which the great masters admitted they could not find a fault." About this time he was introduced by his friend the poet Aretino to the notice and patronage of the Emperor Charles V. In 1530 Charles invited him to Bologna to paint his portrait and execute various other commissions. The emperor was so well pleased with the artist that when he revisited Bologna in 1532 Titian was sent for to paint his portrait a second time. It is said that he accompanied Charles to Madrid, where he was created a count palatine of the empire and a knight of Saint Iago, and that he remained three years in Spain, in which country many of his masterpieces, such as 'The Sleeping Venus,' 'Christ in the Garden,' 'Saint Margaret and the Dragon,' are still to be found. In 1537 he painted an 'Annunciation' for the church of Santa Maria degli Angeli at Murano, but on being refused the price demanded (500 crowns) he presented the picture to the Empress Isabella, who sent four times that amount in return. In 1541 he produced 'The Descent of the Holy Ghost on the Apostles,' 'The Sacrifice of Abraham,' 'David and Goliath'; and in 1543 he painted, at the request of the Venetian senate, his picture of 'The Virgin and San Tiziano.' In 1545 he visited Rome, where he painted the famous group of Pope Paul III., the Cardinal Farnese, and Duke Ottavio Farnese. In 1547, and again in 1550, he was invited by his great patron and admirer, Charles V., to Augsburg. Philip II. continued the pension his father had granted to the renowned painter. Of Titian's private life but little is known. His favorite residence was at Venice, where, after

his position in the world of art was secure, he lived in great splendor, and died of the plague. Titian may be regarded as the master of portrait-painting as relates to character, resemblance, grace, and tasteful costume. He excelled in the figures of women and children, but was not so successful with male forms. He was an exquisite colorist, but his correctness in drawing is less conspicuous. He was particularly remarkable for his accurate observation and faithful imitation of nature, whether in the figure, the landscape, the drapery, or other accessories. Consult: Crowe and Cavalcaselle, 'Titian; His Life and Times' (1879); Heath, 'Titian'; Ticozzi, 'Vite dei Pittori di Cadore' (1819); Northcote, 'The Life of Titian.'

Titicaca, tē-tē-kä'kä, the largest lake in South America, situated on the southeastern boundary of Peru, its eastern shores belonging to Bolivia. It is about 116 miles long and 30 miles wide, and lies at an altitude of 12,635 feet in a large plateau basin between the two main cordilleras of the Andes. It is of irregular shape, and contains several islands. Its surplus water is discharged southward by the river Desaguadero, which flows into Lake Aullagas, and thence disappears in the Salinas Grandes, so that the water of the lake does not reach the ocean. Lake Titicaca was formerly much larger than now, and is still decreasing in area. In spite of the high altitude the shores are inhabited, and steamers ply on its waters. The islands and the regions around the lake contain some of the most interesting architectural remains of ancient Peru.

Titlark, a small lark-like bird of the family *Motacillidæ,* many species of which inhabit most parts of the world in every variety of region, some being migratory, others permanent residents. The nest is made upon the ground, of dry grass and stalks, lined with finer plants and hair, and the eggs are 4 to 6. The American titlark (*Anthus ludovicianus*) is 6½ inches long and 11 in alar extent; olive brown above, each feather darkest in the middle; beneath yellowish brown, the sides of the neck spotted longitudinally with dark brown; round eyes and superciliary stripe yellowish; central tail feathers like back, the others blackish brown, the external one mostly white and a white spot at the end of the second; primaries edged with whitish, and the other quills with pale brownish; bill and feet black. It is very generally distributed over North America, extending to the Pacific and to Greenland, and is accidental in Europe. The flight is exceedingly easy and graceful; it occurs in flocks of tens or hundreds, running fast on the ground, vibrating the tail whenever it stops, not squatting like the larks, but moving the body on the upper joints of the legs. It is found in the fields, on the prairies, along rivers, and on the seashore; the notes are clear and sharp tweets, the last much prolonged; it breeds in the East only north of the Saint Lawrence River, and especially in the coastal districts of Labrador; but in the Rocky Mountain region spends the summer much farther south, but at cool elevations. This bird is very similar to the *A. obscurus* and *spinoletta* of Europe, though the latter has a longer bill and less slender tarsi and toes, and has no yellowish superciliary stripe; the outer tail feathers are not white, and the spots are less distinct below. Among the European species the most extensively distributed is the meadow titlark or pipit (*A. pratensis*), which is a favorite field-bird in Great Britain. The tree-pipit or titlark (*A. arboreus*) is another favorite. Both are kept as cage-birds. Consult general works, and Coues, 'Birds of the Northwest' (Washington 1874).

Title, in ordinary language an appellation or a name.

In Law.— The word title in its derivative sense denotes the sources of ownership in property, but in its ordinary use is synonymous with property or the ownership of property. Common law divides titles to real property into two classes—"titles by descent" and "titles by purchase," the first including only the mode of acquisition through inheritance, and the latter all other modes of acquisition. Modern treatises prefer a classification of the means of acquiring property as by acts *inter vivos,* and by the death of the former owner. Under the first group may be included the methods of original acquisition, such as by accretion, discovery, etc.; lapse of time, such as prescription or limitation; eminent domain, as the assumption of property by the state; and conveyance, which includes all methods of gifts or sales between living persons. Under the group of methods of acquisition upon the death of the former owner are by wills or testaments; descent or inheritance; occupancy; and gifts *causa mortis.* For information consult such works of law as Digby, 'The History of the Law of Real Property'; Schouler, 'Personal Property'; Tiedeman, 'Real Property'; and Williams, 'Real Property' and 'Personal Property.'

Titles of Honor.— Words or phrases bestowed on individuals as a mark of distinction. The use of honorary titles is as old as civilization and seems to have arisen from titles bestowed for some public service, and only later to have been bestowed in virtue of the dignity of the office or employment of the recipient, and even later to have become hereditary. As used by the Greeks and Romans, however, titles conformed to the first and the last customs—they were bestowed for service and were hereditary. Later, Roman offices carried their titles with them irrespective of the merits of the holders, for example, the names Cæsar and Augusta, and the phrase *pater patriæ,* all of which came to be applied to the imperial throne regardless of the character of the occupant. Among modern rulers the titles king and emperor with the feminines and in the case of Russia that of czar, are the titles of supreme heads of government. The word king denotes a ruler as does the Roman equivalent, *rex.* And the word emperor, which is used in the same sense, originally denoted the ruler of an empire or a confederation of several states, each of which had a king at its head. In this respect the word is advisedly applied to the emperor of Germany. But long before the advent of Christianity it had become customary to add to the titles signifying the office, honorary qualifying titles. Henry IV. of England was called "Grace"; Edward IV., "Most High and Mighty Prince"; Henry VII., "Highness"; and Henry VIII., "Majesty." This latter title was universally adopted by the sovereigns of Europe, and was subsequently subjected to further quali-

fication, as in the case of James I., who was called "His Sacred Majesty of England," and was formally addressed as "James, by the Grace of God, King of Great Britain, France, and Ireland, Defender of the Faith," etc. Catholic rulers, meanwhile, had assumed such titles as "Catholic" for Spain, "Most Faithful" for Portugal, etc. The present ruler of Great Britain receives the title, "Edward VII. by the Grace of God, of the United Kingdom of Great Britain and Ireland and of the British Domains beyond the Seas King, Defender of the Faith, Emperor of India," etc. The eldest son of the British sovereign is styled the Prince of Wales, and the eldest daughter the Princess Royal; the other sons and daughters are styled Prince and Princess, and all, together with the children of the sons of the reigning sovereign, are addressed as Royal Highness. The five orders of nobility in Britain are distinguished by the titles of honor — Duke, Marquis, Earl, Viscount, and Baron. These nobles have several titles, granted by distinct patents, in their progressive steps in the peerage. A duke may thus be a Marquis, an Earl, a Viscount, and a Baron; the Duke of Sutherland is, for instance, Marquis of Stafford, Earl Gower, and Viscount Trentham, Baron Gower, Earl of Sutherland and Baron Strathnaver, and a Baronet. One of the inferior titles is permitted as a matter of social dignity to be assumed by the eldest son. Thus the eldest son of the Duke of Sutherland takes the courtesy title, as it is called, of Marquis of Stafford. Courtesy titles do not raise their bearers above the rank of commoners, and consequently the eldest sons of peers are eligible for election as members of the House of Commons. The lowest hereditary title is that of Baronet, which, besides its name, which is placed after the name and surname of its bearer, entitles him to the prefix Sir. The dignity of knighthood is not hereditary. The titles of Esquire and Master (Mr.) are now given indiscriminately to nearly all classes of persons. The continental titles of Duke, Marquis, Count, Viscount, and Baron often differ considerably in rank from the corresponding titles in England.

Titles in the United States.— Hereditary titles and other titles of nobility are forbidden by the Federal Constitution and the citizen of another country who bears such a title when he becomes a citizen of the United States must relinquish his title. Various offices of dignity and trust carry with them certain forms of address, but these forms of address pertain to the offices alone, and the holders of these offices have no claims to the prescribed form of address after their terms of service have expired. The President, governors of States, and ministers of foreign nations are addressed, and spoken of, as your or his "Excellency," save in the case of speaking to the President, who should be addressed as "Mr. President." The Vice-President, members of the Cabinet and members of Congress, heads of departments, assistant secretaries, comptrollers and auditors of treasury, clerks of the Senate and House of Representatives, State senators, law judges, mayors of cities, etc., are entitled "Honorable." Military, naval, ecclesiastical and other professional dignities are distinguished by the titles common to the English-speaking peoples of the world.

The pope of Rome is distinguished by the title "His Holiness," and addressed as "Your Holiness"; cardinals by the title "His Eminence"; bishops as "Monsignor," and in English as "My Lord." The title of bishops is "Right Reverend," that of archbishops "Most Reverend"; deans are addressed as "Very Reverend," and archdeacons as "Venerable." All clergymen and ministers of the Christian religion are styled "Reverend."

Title-deed, a paper, or one of several papers, written or printed, or partly written and partly printed, by virtue of which a person claims ownership or title. The term is often used in the plural to denote the several muniments of title turned over by the grantor on delivering the property to the grantee or his agent, and in this sense title-deeds are any documents containing evidence of the title or any part of the title to real estate or other property so granted. Every owner of property is supposed to have his own title-deeds, but the modern system of registering real estate transfers requires an official copy of the title-deeds to be entered in the office of the registrar or of whatever public agent assumes the duties of registrar, and there be open to the public inspection.

Title Insurance is effected in countries having public offices for the record of titles to real estate through the agency of title guaranty companies. This business has assumed importance in the United States where the system is most fully developed. In that country law requires all transfers of real estate, all mortgages, wills, judgments, etc., to be entered in official registers open to public inspection. In the larger cities these records soon became so voluminous that the matter of verifying title became a cumbersome affair calling for the prolonged services of expert realty lawyers. Moreover such research was attended with long delay and with great expense; yet this had to be repeated every time a fresh transfer or mortgage took place, since the vendee or mortgagee was not apt to accept the property without assurance of its being unencumbered and sound in title. Finally in 1876 a Philadelphia company was organized to guarantee titles, and the plan proved so successful that companies have since been organized in nearly every large city in the country. The plan of operation of these companies calls for large capital, for in order to be independent of the clumsy and sometimes inaccurate methods of public record offices the title insurance companies form their own records of real estate titles in the locality in which they operate, and must maintain for this purpose a large staff of expert title examiners. On account of the size of its force a well-equipped company can make the first examination and guaranty of a title in less than a week, whereas from one to three months was sometimes required by the practising attorneys. The fee required in this first instance is usually about the same as that charged by a reliable lawyer, or, in case of a long examination, about one half of one per cent of the value of the property negotiated. After a property has been once examined and its title guaranteed, the noting of future transactions affecting it is a simple matter, and subsequent guaranties are issued upon short notice and for a small fee.

Title to Property. See REALTY.

Title Registration, a system of public records under which titles to real property are recorded in public offices for the purpose of expediting the process of transfer and of giving legal notice to claims of ownership to lands so entered. In England the registration of titles is of comparatively recent introduction, the system being due to the land transfer acts of 1875, under which it was first successfully practised. The office of record in that country is conducted by a registrar appointed by the lord chancellor, who also fixes the fees for the various services of the office. These fees, paid in the form of stamps, provide the emoluments of office from which the registrar draws his pay. Under the act of 1875 the registrar must approve of the title submitted and in case of a sale the vendor must make affidavit that he has produced all the deeds, wills and other instruments of title as well as all the evidences of encumbrances on the land, in order that the registrar can make a fair entry. When once a title is registered no adverse title will acquire any advantage by length of possession, but any person claiming an adverse interest can lodge a caution of that fact and be entitled to notice of all further transactions on the property. When the registered land is sold the name of the transferee is entered on the register and he is issued a certificate of title. The law is not compulsory in England, but is being gradually adopted because of its advantages over the old system.

In the United States it early became customary to register titles, mortgages, and notices of transfer of interest, encumbrances, etc., in public offices, usually in the office of the county clerk of the court. This officer has no judicial or discretionary powers and is empowered only to register official copies of deeds, mortgages, agreements, etc. In place of the issuance of a certificate the clerk notes on the original or a duplicate deed that a true copy has been entered on the official register and this copy becomes legal notice of claim of title to all the world. The clerk of the court, who is a county officer in the United States, and elected, not appointed, frequently delegates this part of his work to an appointed assistant known as the registrar of deeds. Between the parties of a conveyance the recording or non-recording of the instrument is of no moment, but conveyances made after the first is recorded are void, and any conveyance not recorded is void as against a subsequent conveyance to a bona fide purchase from the person in whose favor a recorded conveyance has been executed. State regulations, however, usually govern the matter of registration in regard to its effect as constructive notice. For the "Australian system" of national land registration, see TORRENS' LAND SYSTEM.

Titles of Honor. See ORDERS (ROYAL) AND DECORATIONS OF HONOR.

Tit'marsh, M. A. or Michael Angelo, a pseudonym employed by Thackeray when contributing his 'Paris Sketch Book,' 'Yellowplush Papers,' etc., to 'Fraser's Magazine.'

Titmouse, one of the diminutive birds of the subfamily *Parinæ*, family *Paridæ*, which are among the most interesting of passerine birds. There are more than 75 known species, ranging widely over most parts of the world except Australia, but most abundant in the temperate and colder regions of the northern hemisphere. None of them are really migratory, though they roam widely during the winter in search of food, nor are they gregarious, though in this particular also stress of weather frequently causes them to gather in flocks, often with other small birds,—as redpolls, finches, etc. They are not songsters, though most of them have characteristic, and frequently musical, call notes, and during the breeding season they sing after a fashion, rather weakly. They are very active, restless, familiar birds, usually showing little fear of man and oftentimes coming about houses in their continual search for food. They eat everything from seeds to the eggs and young of other birds. The nesting habits are varied, but they lay numerous eggs and raise two or more broods each season. The plumage is never brilliant, though occasionally striking, but is most frequently plain, though very tasteful.

Structurally the titmice, aside from their small size, are hard to distinguish from the jays, to which birds their habits also ally them in many ways. The bill is short and stout, straight and unnotched, and there are no rictal bristles, but the base is covered by tufts of bristly feathers, directed forward, entirely concealing the nostrils. The feet are stout, with scutellate tarsi and short toes. The wing is rounded, with ten primaries, of which the first is exceedingly short. The tail as long as or longer than the wing is composed of 12 feathers, and usually rounded or graduated. The plumage of the body, long, soft and loose.

Of the 75 species of titmice, one fifth occur in America, all of these having been taken within the limits of the United States. About two thirds of all the species belong in the genus *Parus*, and the same proportion holds among our American forms. The most abundant and familiar of our species is the black-capped titmouse (*P. atricapillus*), widely distributed and known everywhere as the chickadee. The typical form ranges in eastern America from the Middle States northward, but closely allied sub-species, or species, occupy practically all the rest of the continent. The general color is ashy-gray, the back with a brownish tinge, the under parts white, or nearly so; the crown, nape, chin and throat black, with the cheeks white. In size, the various forms range from 4½ to 5½ inches, of which the tail is about half. The chickadee is a very active, tireless little bird, retiring to the woods and swamps during the summer, but in winter very abundant in our villages and parks and about houses. It can easily be attracted to any spot where food is provided, and if unmolested by cats or otherwise will soon become very familiar. Although it eats bread and crumbs and other articles of a vegetarian's diet, its tastes are carnivorous and it is especially fond of "meat-on-the-bone." When foraging for themselves, chickadees eat an enormous number of insects and thus justify their existence, if that were necessary. As a matter of fact, chickadees are so familiar, so daintily clothed, so cheerful even in the severest weather, and so courageous, and their usual call note "chick-a-dee-dee," is so pleasing, none of our birds is more universally loved and enjoyed. In the spring, when the mating begins, the chickadee

has another note, a plaintive, though not drawled, "pe-wee." The nest is a mass of moss, feathers, wool, plant down, etc., placed in a hole in a stump, tree or fence post, usually not far from the ground. The eggs are five to eight in number in each of the two broods, and are white, spotted with reddish-brown. The chickadee of the South Atlantic States (*P. carolinensis*) is said to have notes quite different from the northern species. In the southeastern United States, ranging north to New Jersey, but rarely further, is another very abundant titmouse, quite different from the chickadee in both color and form, known as the tufted titmouse (*Parus bicolor*). It is a gray bird, with a black forehead, and a conspicuous crest, an inch longer than the chickadee and not so attractive. The notes are not so attractive as those of the chickadee and become monotonous; the most common rendering in words is "peto, peto, peto," but it also has other calls. The tufted titmouse is not so familiar or confiding as the chickadee and is distinctly a woodland bird, seldom seen about houses. It is not shy and is readily approached, while the prominent crest makes it easy to recognize. The nesting habits and the eggs are similar to those of the chickadee, but the latter are considerably larger. A tufted titmouse occurring in the valley of the Rio Grande (*Parus atricristatus*) is notable for its glossy black crest, while the bridled titmouse (*P. wollweberi*) is a related species occurring in the southwestern United States, and is remarkable for the very conspicuous black and white markings on the head. Besides several other interesting species of Parus, the southwestern United States is the home of four or five very small titmice, belonging to the genera *Psaltriparus* and *Auriparus*. The former are called "bush-tits" and though very plainly colored with black, brown and plumbeous, their very small size, four inches or even less, and their large, woven, pensile nests, with lateral entrance, make them an interesting group. The gold-tit (*Auriparus flaviceps*) is of about the same size, but is notable for the rich yellow head, the other upper parts being ashy and lower parts whitish. These little birds build great globular nests of twigs, in the bushes, lining them with down and feathers. The eggs are pale bluish speckled with brown.

Of the tits of the Old World, seven species occur in Great Britain, but one of them, the crested tit (*Parus cristatus*), is only an accidental visitor. The great tit (*P. major*) is the largest European species, though only about the size of our tufted titmouse. The general color is yellowish and gray, with white cheeks and black head and throat. The blue tit (*P. cæruleus*) and the cole tit (*P. ater*) are the commonest of the English species. The former has the top of the head light blue and a bluish cast to the rest of the plumage. It is the species usually called "tom-tit." The azure tit (*P. cyanus*) of Siberia, which is sky-blue and white, and the large Japanese tit (*P. varius*), which is handsomely marked with chestnut, will serve as examples of the more brightly colored titmice. The long-tailed tits of the genus *Ægithalos* are remarkable not merely for their excessively long tails but because they build very elaborate cozy nests, which are purse-shaped and hang free or are attached along one side to the trunk of a tree. The eggs are very numerous, as many as 20 having been found in one nest.

Consult in addition to standard ornithologies, Coues, 'Birds of the Northwest' (Washington 1874); and 'Birds of the Colorado Valley' (Washington 1887).

Tittlebat Titmouse, the name of a London shop clerk who figures as the hero of "Ten Thousand a Year," a novel by Samuel Warren (q.v.).

Titular Bishop, an episcopal title in the Roman Catholic Church substituted by Pope Leo XIII. for the older one of bishop *in partibus infidelium*.

Titular Church, a name given to the parish churches of Rome, as distinct from the patriarchal churches, which belong to the pope, and from the oratories. Each titular church is under a cardinal priest, has a district assigned to it, and a font for baptism in case of necessity.

Ti'tus, companion and well loved friend of Saint Paul. He was converted by the apostle (Tit. i. 4), at Antioch 50 or 51 A.D., and in the same year accompanied him to Jerusalem, and was present at that first council which recognized Gentile converts as part of the church, and exempted them from the burden of the Mosaic ritual (cf. Acts xv. 1–35 with Gal. ii. 1–3). Paul soon afterward carried out the liberty thus accorded by refusing to require Titus, a Greek, to be circumcised (Gal. ii. 3–5). Titus was subsequently with Paul at Ephesus (56), whence the former was sent on a special mission to the Corinthians, carrying with him Paul's second epistle to that church (2 Cor. viii. 6, 22, 23; xii. 18). When Titus returned (57 A.D.) he found the apostle in Macedonia (2 Cor. vii. 5–6, 13–15). Subsequently (65 or 66 A.D.) he was left in Crete to arrange the affairs of the Church and "ordain elders in every city" (Tit. i. 5). Returning thence to Rome he was despatched by Paul (66 or 67) to Dalmatia (2 Tim. iv. 10). Titus returned to his work in Crete, and died at an advanced age. See also TITUS, EPISTLE TO.

Titus, Flavius Sabinus Vespasianus, Roman emperor: b. 40 A.D.; d. Reate 13 Sept. 81 A.D. He was the son of Vespasian, whom he succeeded as emperor in 79 A.D., and was brought up at the court of Nero with his friend Britannicus, whom he accompanied in his wars in Germany and Britain. Later he commanded a legion in the war of Vespasian against the Jews, conducting the campaign in Judæa in 69 in the place of his father, who was then called to the imperial throne. At the end of a long and cruel siege Jerusalem was taken by Titus 8 Sept. 70. Titus returned to Rome in 71, where he was rewarded with the title of Cæsar and given a part in the government of the empire. He early manifested the qualities of a humane and able ruler and he became the idol of the Roman people. The Colosseum, begun by Vespasian, was completed under his direction, and the public baths named in his honor, and other institutions for the public benefit were established by him.

Titus Andron'icus, a repulsive drama of bloodshed and crime produced in 1591, and variously ascribed to Marlowe, Kyd and Shakespeare. It is included in the original Folio Edition of Shakespeare's plays printed in 1623.

Titus, Epistle to, one of the epistles of Saint Paul, stated to have been written to Titus, as bishop over the Cretans, from Nicopolis in Macedonia. It is known as one of the "Pastoral Epistles," because devoted chiefly to admonitions on the subject of pastoral duties. In this epistle Saint Paul describes what a bishop ought to be, and applies severe language to certain of the Cretans. This, and the two epistles to Timothy, have been subjected to much discussion. See TIMOTHY, EPISTLES TO; TITUS.

Titusville, Pa., city in Crawford County; on the Pennsylvania and the Dunkirk A. V. & P. R.R.'s; 150 miles north of Pittsburg, and 50 miles southeast of Erie, Pa. The city is on a plain which slopes slightly toward the south and east. The natural drainage has been supplemented by an excellent system of sewerage. The water is obtained from artesian wells, seemingly inexhaustible, and is distributed by pumping directly to consumers. The broad streets are largely paved and the long lines of trees add greatly to the charm and beauty of the city. Electric trolley lines run over many of the principal streets.

Industries.— The manufacturing industries consist of a tannery, one of the largest in the United States, iron and steel works, machine shops and foundries, oil refineries and paraffine works, radiator works, two large chemical works, three planing mills, carriage and wagon works, sash and blind works, furniture factories, silk mill, chair works, wood specialty work, cutlery works, electric light and power plant, and forge works. The output consists of iron car tanks, steam engines and boilers, oil well machinery, and fittings, gas, gasoline engines, etc. There are large oil fields in the vicinity and the first artesian well in the world of which there is any record, sunk for petroleum, was drilled about two miles south of Titusville, in the summer of 1859, striking oil on 27 August of that year. The government census of 1900 gives the number of manufacturing establishments 113; average number of wage-earners, 1,204; average yearly wages, $522,749; cost of materials used, $1,657,275; the annual value of products, $2,995,202.

Churches, Educational Institutions, etc.— There are 12 church edifices, and two halls for religious services. The educational institutions are a high school with a three years' course, four graded public schools and one kindergarten, all under one superintendent, Saint Joseph's Academy, kindergarten, and parish school. The city has also an excellent library, "The Benson Memorial Library." The Titusville Hospital, which is supported mainly by the State, is located there.

Government, History, and Population.— Titusville was first settled in 1796, became a borough in 1847, and chartered as a city in 1866. The town was laid out in streets in 1809, and into building lots in 1816. The city owns and operates the waterworks and one of the electric light plants. The government is vested in a mayor, controller and treasurer, elected for a term of three years; a common council of eight members, elected for two years and a select council of five members, elected for four years. The majority of the population are native born, the predominating foreign element, consisting of Scandinavians, Irish and German. Pop. (1900) 8,244. M. N. ALLEN.

Tiui, tē-wē', or **Tivi,** tē'vē, Philippines, pueblo, province of Albay; on the northeast coast; 23 miles north by west from the pueblo of Albay. It is the centre of a hemp growing region, and exports hemp by way of Tabaco. It is especially celebrated for its thermal springs of iron and sulphur waters with medicinal properties, which are visited by large numbers of natives.

Tiumeñ, tyoo-mĕny', Russia, in Siberia, government of Tobolsk, 90 miles southeast of Tobolsk, on the Tura River. It is an important centre of trade, lying on several commercial routes, with railroad communication. It has a large technical school. Its principal manufactures are leather, soap, candles, carpets, pottery and woolen goods. These articles are exported to China, the Kirghiz steppe, Bokhara and everywhere in Siberia. The Tiumeñ carpets are especially renowned, and are hand-work. In Tiumeñ is located a famous exile prison. Pop. (1897) 29,588.

Tivoli, tē'vō-lē, Italy, in the province and district of Rome, on the Teverone or Anio, 24 miles northeast of the capital. Its position on a rocky height overlooking the river is extremely picturesque. Tivoli commands a fine view of Rome and the Campagna. It contains a fine modern cathedral which contrasts sadly with the other town buildings. Its antiquities are numerous and interesting, and include a temple of the Tiburtine sybil, temple of Vesta, villa of Hadrian, etc. The artificial cascades formed by the Teverone constitute an interesting feature of the landscape and supply power for the electric lighting of Rome, and for various factories. Tibur was one of the most venerable towns of Latium, and important in the Latin Confederation. It became subject to Rome in 338 B.C. Pop. (1900) 11,500.

Tlaxcala, tläs-kä'lä, or **Tlascala,** Mexico, the smallest state in the republic, situated between the states of Puebla, Hidalgo, and Mexico. Area 1,596 square miles. The capital, Tlaxcala, was in ancient time a large city, but its present population is only 2,715. The state lies within the plateau region, and its surface is broken by high mountains. The principal occupations are agriculture and some manufacture of cloth, though iron and silver are found in the mountains. Tlaxcala was at the time of the Discovery, a powerful native state which had maintained its independence of the Aztecs. It became an ally of Cortes and retained its own government for a time under the Spaniards. Pop. (1900) 172,315, almost all Indians.

Tlemcén, tlĕm-sĕn', Algeria, in the province of Oran, 70 miles southeast of the city of Oran. It is a walled town with nine gates, and is divided into three sections, namely, the citadel and military establishment; the business portion, containing the residences of foreigners; and the native section. The town stands amid olive-groves and vineyards. It has 32 mosques, Protestant and Catholic churches, a museum, and Jewish synagogue. The manufactures comprise textiles, carpets and leather articles, burnooses, etc. Trade is important, especially with Morocco. Pop. (1901) 22,273.

Tlinket, a group of tribes which constitute a distinct linguistic stock known as Kolushan. They inhabit the coast and islands of southern Alaska. Previous to the advent of the white man their houses were rudely constructed, and their trade carried on with neighboring tribes. The exchange of slaves was carried on extensively, and they were treated by their masters with the greatest cruelty. They have greatly diminished of late years, till there now remain but about 5,000, a large number of them being employed in the canning industry.

Toad, an amphibian of the anourous family *Bufonidæ* or some related family in the series *Arcifera,* in allusion to the structure of the shoulder girdle. The *Bufonidæ* present the following distinctive features: The tongue is well developed, fixed to the front of the mouth, and has the hind end free. The result of this arrangement is that it can be filliped by means of appropriate muscles with the greatest speed and precision, and thus serves these usually totally toothless animals in the capture of insects which adhere to this mucous-coated organ. Teeth are always absent from the jaws, but may be present on the vomer in a few foreign genera. The hind toes are more or less webbed, the front toes webless, and the ends of the toes are neither clawed nor furnished with adhesive disks. In all cases the vertebræ are procœlous or have their bodies hollowed in front, the transverse processes of the sacrum are expanded and ribs are absent. This family is an extensive one of about 15 genera and 100 species and is cosmopolitan, but is especially well represented in tropical America. The species differ considerably in habits, most of them being terrestrial burrowers, but some are aquatic, others arboreal.

Within the United States *Bufo* is the only genus, being represented by 9 or 10 species, most of which belong to the southwestern United States and Mexico. The common eastern toad (*B. lentiginosus*) is found in one or other of its sub-species throughout the eastern United States and Canada. The familiar roughness and wartiness of the skin of toads is due to the presence of glands and, especially on the head, to bony deposits. They are chiefly terrestrial and nocturnal, and feed upon insects of which they destroy vast numbers. Toads visit the water in March or April, their breeding season, for the purpose of depositing their eggs, which are in long strings and are fertilized by the male upon their extrusion. During the mating season the males are very noisy at night and so pugnacious that they sometimes kill one another in their encounters. Development takes place rapidly and the tadpole-stage is passed in three or four months, when the young toads leave the water in multitudes. The popular repugnance to these perfectly harmless animals has no doubt arisen from their unprepossessing aspect and outward appearance. No venom or poison apparatus of any kind exists in these creatures; and save that the secretions of the skin may be of acrid or irritant nature when brought in contact with cut or exposed surfaces, they are utterly harmless to man. There is a swelling above the eyes covered with pores, and large, thick, and prominent enlargements behind the eyes which secrete an acrid fluid, which protects these animals from the attacks of carnivorous mammals. They also swell up with air when attacked by snakes. When handled, toads frequently eject urine from the vent, but the widespread belief that the contact of this fluid with the skin produces warts is utterly unfounded. Toads are extremely tenacious of life, and can exist a long time without food; their hibernation in mud, cracks, and holes has probably given rise to the stories of their being found in places where they must have existed for centuries without food and air. These stories, however, have no foundation in fact, for Dr. Buckland proved, by direct experiment, that no toad can live for two years if deprived of food and air. Another common belief that toads are often rained down, is probably to be explained by the fact that great numbers of young toads frequently leave during showers of rain the vicinity of pools in which their larval life was spent. Toads are really extremely interesting animals, and much entertainment can be derived from their observation.

Among foreign toads are the great *Bufo agua,* large enough to fill a quart measure, of the West Indies and South America; the green toad (*B. viridis*) of Europe, noted for its change of color; the long-tongued toad (*Rhinophrynus dorsalis*) of Mexico, which feeds on termites; the European fire-toad (*Bombinator igneus*), so called from its brilliant red under parts and belonging to the family *Discoglossidæ;* and the remarkable Surinam toads (q.v.) which are tongueless and carry the young in little cavities on the back. The last belongs to the distinct family *Pipidæ.* The spade-foot toad (q.v.) and the tree-toads or tree-frogs (q.v.) belong respectively to the families *Scaphiopidæ* and *Hylidæ.* Many of the toads have remarkable and interesting breeding habits, for accounts of which reference must be made to works of herpetology.

Consult: Cope, 'Batrachia of North America' (Washington 1889); Boulenger, 'Tailless Batrachia' (London 1892); Gadow, 'Amphibia and Reptiles' (New York and London 1901); Sampson, 'American Naturalist' (1900).

Toad-flax, a common roadside weed (*Linaria linaria*) belonging to the *Scrophulariaceæ.* It somewhat resembles a snap-dragon, but is smooth and has many linear leaves, either alternate, or opposite and verticillate on the lower portions of the stem, and very pale-green. The stem is prolonged by a terminal bracted densely flowered raceme. The blossoms are pale-yellow with a short spur, a two-lipped corolla, the lower lip spreading and three-lobed, with a base so enlarged as to nearly close the throat with an orange-colored palate. This combination of orange and yellow has given rise to the name "butter-and-eggs." It is also called ranstead. The plant has been naturalized from Europe, and it rather pretty, but is very tenacious, and very difficult to eradicate.

A native toad-flax is *L. canadensis,* a slender plant, with blue flowers and with a tendency toward oppositeness. The Kenilworth ivy (*Cymbalaria cymbalaria*) is also called ivy-leafed toad-flax, and is a glabrous trailing perennial, with reniform-orbicular leaves and bluish flowers. *L. triornithophora,* a European plant, is peculiar for its purple long-spurred flowers blooming in whorls of three, and resembling birds, which has suggested the title, three-birds

toad-flax. The American bastard toad-flax (*Comandra umbellatum*) is a delicate, pale-green smooth plant of the sandal-wood family, with greenish white or purplish, campanulate corollas and oblong leaves quite unlike the *Linaria*. In England *Thesium linophyllum*, with leaves like those of toad-flax, is known by the same name as *Comandra*.

Toadfish, any fish of the genus *Batrachus*, so called from the large head, wide gape, and generally toad-like appearance. The common toad-fish (*B. tau*) is from eight inches to a foot long, light brown marbled with black. There are about 12 species, dwelling principally in tropical and sub-tropical seas.

Toadstone. (1) In geology, an old English name for certain amygdaloidal basaltic rocks occurring in Cumberland, England. The name is also applied to a mottled, apparently spherulitic felsite, found near Boston. (2) Fragments of rocks or precious stones, resembling toads either in color or form, also fossils of various kinds, supposed to possess special therapeutic virtues. Such objects were for many centuries highly prized in Europe, being worn as rings or amulets.

Toadstools, properly fungi of the family *Agaricaceæ*, which includes the edible mushrooms. See FUNGI.

Toaspern, Otto, American artist: b. Brooklyn, N. Y., 26 March 1863. He was graduated at the Royal Academy of Fine Arts, Munich (1888); was the pupil of N. Gysis and P. Nauen; and became an instructor in the National Academy of Design, New York. He is best known as an illustrator of 'Life'; 'Ladies' Home Journal'; 'Century'; 'Harper's,' and several leading European periodicals.

Toast, originally bread dried or scorched before the fire. As early as the 16th century it became the fashion in England to add toasted bread to drinks. From this habit the term toast came to be applied to a drink of honor proposed to some person or sentiment during the course, or at the conclusion, of a meal. The growth of social drinking in the 17th century greatly increased the custom of toasting, and it became common to toast not only the reigning monarchs, the hosts, and the flag, but each person of the assembled company, absent friends, and numerous sentiments. Finally the term came to denote not only the drink but the person or sentiment toasted, and in this dual sense the word is used to-day. Toasts are properly drunk standing, and it is the modern custom to have some person present reply to the sentiment proposed in an appropriate speech. Consult Chamber's 'Book of Days'; and Valpy's 'History of Toasting' (1881).

Tobacco, a very important plant, belonging to the natural order *Atropaceæ*, or night-shade. The introduction of the use of tobacco forms a singular chapter in the history of mankind. How long it had been in use among the aborigines of America before the discovery by Columbus there are no means of approximating. It is certain it had been used for many ages. Columbus, in 1404, observed the natives smoking it wrapped in the delicate husks of the maize, a practice which is yet in use by the Indians of Mexico. Tobacco was altogether unknown to the civilized world before the discovery of America. The claim made by the Chinese that it was used by them before that period does not rest upon evidence sufficiently strong to make it worth consideration. The accounts of its early introduction into Europe are meagre and more or less conflicting.

History.— It is probable that the first to bring the plant to notice was Francisco Fernandes, a celebrated physician who was sent to Mexico by Philip II. in 1558 to investigate the flora of that region. He brought specimens of the tobacco plant to Spain. In 1560, Jean Nicot sent seed from Lisbon to Paris while he was French ambassador to Portugal. From him it received its generic name. In 1586, Ralph Lane, the first governor of Virginia, and Sir Francis Drake brought the first tobacco and pipes to England. Sir Walter Raleigh was a smoker of tobacco, though Governor Lane is said to have been the first Englishman to contract the habit. During the period from its first introduction to the close of the 17th century its use had spread throughout Europe and among the western nations of Asia, notwithstanding the steady and resolute opposition of kings, sultans, popes, and priests to its use. John Rolfe, the husband of Pocahontas, began systematically to cultivate tobacco in 1612. In 1616 Sir George Yeardley, the deputy governor of Virginia, encouraged the colonists to grow it for profit. In the following year so alluring was the prospect of gain from its cultivation that when Governor Argall came to Jamestown "he found all the Publick Works and Buildings in Jamestown fallen to decay and not above five or six houses fit to be inhabited; the market places, streets and all spare places planted with tobacco and the colony dispersed all about as every man could find the properest place and best conveniency for planting." Twenty thousand pounds were shipped to England in June 1619 and from that period to the present it has formed a large item in the commerce of the country, notwithstanding it is taxed heavier than any other cultivated product whatever. The most absurd restrictions were put upon its cultivation and sale, and even the number of leaves to be left to a plant was fixed by the Virginia Company. Heavy duties were imposed, the size of the casks prescribed and even the prices were established by the governor and council. In the year 1676, the custom duties collected in England on tobacco grown in Virginia amounted to 120,000 pounds sterling. During the four years 1772 to 1775 inclusive, a total of 397,475,139 pounds were exported. From 1776 to 1782, during the seven years of the Revolutionary War, only 86,649,333 pounds found its way to European markets, about half of which was consumed in Great Britain. From 1619 to 1641, the prices ranged from three shillings down as low as three pence per pound. Just before the breaking out of the Revolutionary War, the prices rose rapidly, and unmanufactured tobacco was sold in London at 12 pence per pound in 1775. Before the outbreak of the war in 1812, tobacco sold in Dublin at 15 pence per pound. During the Civil War in the United States, lasting from 1861 to 1865, the average price of the heavy types of tobacco in the markets ranged from 12 cents to 45 cents per pound, reaching its highest prices in 1864–5. This was before the white burley or yellow tobacco had

begun to be cultivated to any considerable extent.

Species of Tobacco.— Tobacco belongs to the nightshade (*Solanaceæ*) family, which embraces in its genera many of the best known domesticated plants and vegetables. Among them are red pepper, Irish potato, henbane, jimson-weed, tomato and egg plant. The genus *Nicotiana* embraces about 50 species, but the *N. tabacum* and the *N. rustica* supply nearly all the tobacco of commerce. The tobaccos cultivated generally in Cuba; the United States; the Philippine Islands, and the Latakia tobacco of Syria belong to the species *N. tabacum*. The species of *N. repanda* is cultivated to some extent in Cuba and is known as Yara tobacco. *N. quadrivalvis* is cultivated by the Indians on the Upper Missouri River, but the product does not enter into commerce. A few other ill-defined species are cultivated by the Indians on the Columbia River and among the Rocky Mountains. The *N. Persica*, said to be a native of Persia, is known as Shirez tobacco, and takes its name from a town in Persia, in the province of Farsistan, where it is cultivated. The Turkish tobacco and the Hungarian tobacco belong to the species *N. rustica*. The latter named are said to produce the finest pipe smoking tobaccos in the world. There is a species, probably the *N. rustica*, found growing wild in Mexico in the deep narrow valleys of the Sierra Madre Mountains. The same stalk sends forth new sprouts from year to year, the leaves of which are gathered by the natives and cured in the sun to a dull greenish color, and for this reason and the further reason that the species has greenish flowers, it is called "green tobacco." The species that supplies most of the tobacco used by mankind in every part of the world is *N. tabacum*. It grows from two to eight feet in height; leaves, ovate, oblong or lanceolate in form, decurrent and from 12 inches to 42 in length and 8 to 24 inches in width. The leaves are alternately attached to the stalk spirally, so that the ninth leaf overhangs the first and the tenth leaf the second. In ordinary varieties the distance between the leaf-buds on the stalk is about two inches. In the smaller varieties it is less. In the species *N. tabacum* the flowers appear in clusters with corollas of rose color or white tinged with pink, funnel-shaped, two inches long with inflated throats. The corolla of the *N. rustica* is green and funnel-shaped, one inch long. Other species, as the *N. quadrivalis* and *N. repanda*, have white or yellow corollas. Fully 100 varieties of the *N. tabacum* are cultivated in Virginia, Kentucky, Tennessee, Pennsylvania, Cuba and other tobacco-growing States and countries. Among the most popular varieties for cigar tobacco are the Connecticut Seed Leaf, East Hartford Broad Leaf, Baltimore Cuba, Belknap, Havana Seed, Duck Island, Glessner, Little Dutch, Lancaster, Broad Leaf, Spanish Seed, Sumatra Seed, Vallandigham and Wilson's Hybrid. For heavy shipping tobacco the following varieties are preferred, namely, Beat-All, Bullface, Clardy, Frederick, Long Green, Love-Lady, Mann, Orinoco, Pryor, Shoestring, Sleek Stem, Thickset, Twist Bud and Yellow Mammoth. For making yellow tobacco the following varieties are excellent: Adcock, Bullock, Cunningham, Flanagan, Gooch, Hester, Hickory Leaf, and Pittsylvania Yellow. There are two kinds of Burley, the red and white, though the latter variety is grown now almost exclusively. There is but one variety of the Perique. These varieties are distinguished from one another by the form, color, size and texture of the leaves; by their fragrance and adaptability to particular soils and uses; by their absorptive capacity; by their varying aptitudes to secrete gums and oily matter while ripening; by the expansiveness of leaves and elasticity of the cured product; by the smoothness or corrugation of the leaves, and by the various hues which the plant assumes while growing. Some have the leaves enveloping the stalk at their base, some are ruffled, others have a stem stalk. Some have a small midrib and delicate forked veins, a peculiarity of the Henry County, Virginia, leaf; others have a coarse, bony structure, but large leaf and thin web. Some varieties are long in maturing; others will ripen in six or eight weeks from the time of transplanting to the fields. All these varieties are the result of cross-fertilization of varieties of one species. The fertilization of one species with another produces generally barren hybrids. A plant that is cross-fertilized with another variety grown under different conditions of soil and climate shows marked improvement in size and weight, but not always in the quality of the cured product. Darwin ascertained that the seed from the crossed plants germinated quicker and the young plants grew more rapidly in the seed bed. The plants also attained greater height and the superiority of weight was quite manifest.

Types of Tobacco.— There are five great leading types of tobacco grown in the United States. These are the Seed Leaf, the White Burley, the Heavy Shipping or Dark tobacco; the Yellow tobacco and the Perique. The seed leaf embraces all cigar tobaccos, for which there is a demand in the United States, including the Havana seed, the Cuba tobacco and the American-grown Sumatra. The cigar tobaccos are grown in the Connecticut and Housatonic valleys of New England; in some central counties in New York; in the counties bordering the Susquehanna River in Pennsylvania; in the Miami Valley in Ohio; in the southern parts of Wisconsin; the northern part of Illinois, and in Florida. The White Burley tobacco, used mainly for making plug and fine cut chewing tobacco and the lower grades of pipe-smoking tobaccos, is grown in the southern part of Ohio and in 44 counties in north central Kentucky, and in parts of Virginia, West Virginia, Missouri, and to a limited extent in Tennessee. The Heavy Shipping or Dark types are grown in all the northern counties of Tennessee; throughout all the counties of Kentucky, except those growing the White Burley type; in the central counties of Virginia, with Lynchburg as the centre, and in the southern counties of Maryland. The Yellow tobacco districts cover nearly all the counties of the Piedmont regions of North and South Carolina; many in the Champlain regions of the same States and several in the mountainous districts of Tennessee and North Carolina. This tobacco is also grown in what is known as the south side counties of Virginia, that is, those counties contiguous to Danville, the greatest market for yellow tobacco in the world. This special type

is used for plug wrappers, for making high-grade pipe-smoking tobacco and granulated tobacco for cigarettes. Perique tobacco is grown only in Louisiana, in a very limited way, in Saint James parish and tentatively in a few others. Its reputation is out of all proportion to the amount grown, which rarely exceeds 50,000 pounds per annum.

Soils.— For the growing of the Seed Leaf and Havana Seed varieties a strong, highly manured soil is essential. It must be grown rapidly and it must be harvested just at the stage when the expansion of the leaves has ceased and the process of granulation and the secretion of gummy substances begins. The soils for the growing of White Burley must be highly fertile. Generally they are the residuum of disintegrated limestones, light gray in color, friable and quick to bring the plant to maturity. Three fourths of all the soils that have grown this variety most successfully are adapted to the growth of blue grass and are derived from the weathering of the Trenton limestones. No reddish soils will produce this type of tobacco to perfection. On the other hand, the heavy shipping types attain their highest standard on soils of a reddish hue, with much clay and oxides of iron in their composition, tenacious, rich, strong and durable. The less sandy material in the soil, the higher the character of the product. The best soils for this type are derived from the decomposition of the lower carboniferous cherty limestones. The yellow tobacco, now so extensively and profitably grown, unlike all other types, requires a sterile soil. It must be light, cream-colored or yellowish in color, sandy in composition and highly porous. On this sponge-like foundation, just enough fertilizing matter must be applied, usually the super-phosphate of lime mixed with a fair proportion of potash and nitrogenous substances, to bring the plants to a proper size when it is best that the fertilizers be exhausted so that the plants may decline in vitality, growing more and more yellow like the hickory leaves in autumn until they are harvested and the golden hues arrested and fixed by the highly scientific methods of curing, which is done by employing certain degrees of heat at certain stages of curing, which heat is supplied by flues or open charcoal fires. Old fields that have been exhausted by improvident cultivation, abandoned and grown up in chinquapin and persimmon bushes, old field pines, broomsedge and other growth, indicative of sterility, have been found in practice to be the best places for the growth of the highest grades of yellow tobacco. All red soils or highly manured soils, especially those enriched with stable manure or those derived from trappean rocks, are shunned by the successful grower of yellow tobacco. There is a sub-type of the yellow tobacco known to commerce as spangled tobacco that grows in the southeastern counties of Ohio, in the northwestern part of West Virginia, not bordering the Ohio River, and to some extent in Maryland. About two thirds of the product is air-cured and the other cured by fire. The air-cured is used for domestic consumption; the fire-cured for exportation, and this statement is generally true of all the tobacco grown in the United States, with the exception of a small quantity of fire-cured tobacco grown in Henry County, Va., and of the air-cured seed leaf that is exported. The Perique tobacco is grown in Louisiana by the descendants of the Acadians, upon the low-lying lands bordering on and enclosed within the swampy areas lying back from the Mississippi River. These places are called vacheries, because the early Spanish settlers were accustomed to drive their cattle to such spots that they might browse on the cane and other tropical plants that covered the surface. The soils are black with humus, very fertile and are elevated but a few feet above the water. So great is the vegetable matter in these soils that they will often burn into ashes to a depth of a foot or more if fires are kindled on them.

Soils Affecting Color and Texture.— There is a well-defined correlation between the color of the soil and color of the tobacco grown upon it and also between the constituent elements of the soil and the quality of the cured product. It has been mentioned how the pale yellowish soils grow a tobacco of a yellow color. The grayish soils of the Blue Grass region will whiten the color of the White Burley. This latter type, planted on red soils, will show more brown or red in the cured leaves. The rich, dark, heavy shipping tobacco grown on reddish or chocolate colored soils is soft, pliant, oily, and silky, resembling to the touch a kid glove. Its pores are filled with gummy substances to such an extent as to impair its absorptive capacity. A light colored soil, whether of arenaceous or clayey material, will yield a product that will cure to lighter colors and be of lighter weight than that grown on soils of a darker color. Tobacco grown on sandy soils is more porous, but is much coarser than that grown on clayey soils. Newly opened land, or what is called in the South "new ground," whatever its character, will mature a crop of tobacco quicker than old lands of the same general characteristics, and the product will be lighter in color. Perique tobacco, so strong in the essential principle of tobacco, is almost as black in color, after being cured in its juices, as the soil upon which it is grown. Situation has much to do with the quality of cured tobacco, other things being equal. A Southern exposure will make a tobacco lighter in body, brighter in color and with less gummy substances in its composition. A northern slope, receiving less sunlight, will require a longer period for bringing the tobacco to maturity. It has more time for storing up gummy substances. An eastern exposure will make tobacco intermediate between that grown on the northern and southern exposures, while that grown on western slopes will be more like that grown on a southern slope, as it receives more of the heat of the sun than that grown on an eastern exposure.

Cultivation of Tobacco.— The cultivation of tobacco does not differ materially from the cultivation of cabbage. Seed beds are prepared in February, March or April, usually by burning the land until it is of a reddish color. Afterward, it is carefully dug up, but it is best not to reverse the soil. New land is best for seed beds. A tablespoonful of seed to a plat ten steps square is sufficient. Rake or tramp the bed lightly and then cover with canvas. The land for the growing of tobacco should be well

broken, made fine by repeated plowings and harrowings, laid off from three to three and a half feet each way, or for Seed Leaf or Havana seed varieties, beds thrown up are preferred with the plants set 16 to 18 inches apart on the beds. The space given each plant must be in proportion to the probable size of the plant at maturity. It should be cultivated by frequent plowings and hoeings and the field kept free of all other vegetable growth. The plant must be topped, that is, the seed bud pinched out, leaving 10 or 12 leaves for heavy tobacco; 16 to 18 for White Burley, Yellow Tobacco and Seed Leaf. To make heavy tobacco, the best results are sometimes obtained by topping to eight leaves; to make tobacco of a more delicate texture, a larger number of leaves should be left on each stalk. All subsidiary sprouts or suckers that put out at the axils of every leaf must be removed at least once a week and the horn worms diligently sought for and killed. A neglect in this particular will destroy all the most valuable qualities of the cured product.

Harvesting and Curing.—The length of time between topping and harvesting varies greatly. For the Seed Leaf from two to three weeks; for Yellow tobacco and White Burley, from four to five weeks; for Heavy Shipping or Dark tobacco, from six to eight weeks. The cigar varieties are cut with a tobacco knife, saw or hatchet, and speared on to laths four and a half feet in length, about six plants to each lath. The laths are then hung up on tier poles in the curing house, about 10 to 12 inches apart. The White Burley is harvested by splitting the stalk a little more than half its length. After wilting, each plant is straddled upon a stick. The sticks with about seven plants on each are put upon a scaffold in the open air, where the tobacco gradually loses some of its sap, which lessens the liability to pole-sweat. Afterward the sticks are transferred to the curing house and ranged on tier poles, an equal space being given as with the Seed Leaf. Heavy shipping tobacco is housed in the same way as White Burley, only it is generally taken at once to the curing house. Yellow tobacco is usually harvested by stripping the leaves from the stalk, as they successively ripen in the field. These are fastened by strings to sticks which are hung up in the curing house. Perique tobacco is harvested by cutting the plants with a hatchet, driving a piece of cane in each, so as to form a hook and hanging it on a rope stretched across the curing house. As the leaves become enbrowned, they are taken off, stripped of their midribs, and put under heavy pressure. The White Burley and Seed Leaf varieties are air-cured in houses that may be ventilated at will; the Yellow tobacco is cured in very closely chinked and daubed log barns by artificial heat distributed by iron or brick flues run through the houses; the heavy shipping tobacco is cured by open log fires, kindled directly under the tobacco. The creosotic flavor, imparted by the smoke, is one of the requirements demanded by most European consumers. The Perique tobacco is cured in its own juices by subjecting the leaves to intense pressure, causing an exudation of the juices which, after being aerated by exposure to the atmosphere, are re-absorbed by the tobacco when it is again subjected to pressure. This process is continued every day for many weeks until it gives out a rich spirituous flavor when it is put up in carottes. A small quantity of tobacco grown in Spottsylvania County, Va., is cured by exposure to the sun. It is sweet, delicate in flavor and very popular but difficult and expensive to cure properly. It is used altogether for making chewing tobacco. Growing tobacco under canvas covering has been experimented with under the direction and supervision of the United States Agricultural Department in Florida, Connecticut, Texas, and Kentucky with remarkable success. The plant matures earlier; it yields more largely; it is thoroughly protected against insect enemies and the texture of the leaf is much finer and better adapted for wrappers, which places it in the best grades that sell at highest prices. Though expensive, this method of growing fine tobacco may be profitably done under intelligent and careful management.

Preparing Tobacco for Market.—It is first assorted into grades. These grades vary with the different types from two to ten. Each grade is kept separate. The Seed Leaf and Havana Seed varieties divided into wrappers, binders and fillers are packed and pressed in boxes 36 inches long by 28 inches wide, each one having the capacity of from 300 to 350 pounds. These boxes are placed in a warehouse until the tobacco goes through a "sweat" or fermentation in May or June, when it is ready for the market. The White Burley and Heavy Shipping types are prized in casks or hogsheads, the most approved size of which is 56 inches high by 42 inches in diameter. From 1,400 to 1,800 pounds are prized into each hogshead and for the lower grades, from 1,800 to 2,200 pounds are not unusual. The amount of White Burley prized into a hogshead will run, for finest grades, about 1,000 pounds, and for the inferior grades, from 1,200 to 1,400 pounds. Yellow tobacco is packed loosely in tierces or truncated-cone-shaped casks, 250 pounds to the tierce and carried to market. Most generally it is carried in wagon beds and put upon the warehouse floors, where it is sold to the highest bidder. All other sorts are sold by samples drawn by properly appointed inspectors.

Economic Results from Variability of Species.—The economic results from variability of species have been pronounced and astonishing. The White Burley variety originated in Brown County, Ohio, in 1864, a sport of the Red Burley, and by reason of its useful qualities its area of cultivation has been extended over a wide extent of Kentucky and Ohio. It has great absorptive capacity which makes it very profitable to the manufacturer, as it will absorb more than its own weight of the sauces with which it is treated in its manufacture. Its coefficient of absorption is 2.60, while the coefficient of absorption of the heavier types is only 1.48. White Burley is also popular with consumers as its low content of nicotine, being only 2.80 per cent of that substance, as against 5.80 and 6 per cent of the stronger sorts, permits of its use without the disagreeable nervous effects produced by stronger tobaccos. These qualities brought about an immense demand for it and the result has been that much of the most famous stock-breeding districts of Kentucky

have been transformed into tobacco farms for the growth of White Burley tobacco. Splendid blue grass pastures that had been the ornaments of central Kentucky and the pride for generations of the proud landed proprietors, have been broken up and planted in this variety or rather incipient species of tobacco, the profits from which have enriched the planters. The stupendous economical effect of the growth of yellow tobacco in North Carolina is another illustration of a total change in agriculture wrought by variability of species in the tobacco plant. Old fields, upon which many former generations had lived in penury and died in poverty, became the chief cornerstone of the agriculture of the State. Oftentimes from $150 to $300 are made from a single acre of tobacco. The prices of these old worn out lands, perfect pictures of sterility, desolation and unfruitfulness, have advanced from 50 cents per acre in 1870 to $30 and $50 per acre in 1904. Great centres of trade have sprung up, new lines of railroad built and manufacturing industry has advanced more rapidly in North Carolina than in any other Southern State. The profits from the yellow tobacco crop laid the foundation for the building of a large majority of the 7,000 manufacturing establishments now in North Carolina, of which 679 are of textiles and 101 for the manufacture of tobacco. Such a transformation has rarely, if ever, taken place in the agricultural and industrial history of any country.

Production.—The total production in the United States in 1899 was 868,163,275 pounds, grown upon 1,101,483 acres; average yield per acre, 788 pounds, value, $56,993,003. The crop was grown on 308,312 farms. Of these Kentucky had 86,534; North Carolina, 51,106; Virginia, 44,872; Ohio, 16,666; Tennessee, 27,960; Pennsylvania, 9,621; Wisconsin, 6,919; Maryland, 5,338; Connecticut, 2,909; South Carolina, 6,744; New York, 4,221. In 1889 the production was 488,256,646 pounds, grown on 695,301 acres; average yield 762 pounds per acre, value $32,396,140. The report of the crop for 1903 was 815,972,425 pounds, grown on 1,037,735 acres, showing a yield per acre of 786.3 pounds, with an average value of 6.8 cents per pound, giving as the total value of the crop $55,514,626.

The following table will show the rank, acreage, number of pounds grown in each State and values for the year 1899:

Rank	State	Acres	Pounds	Value
1	Kentucky	384,805	314,288,050	$18,541,982
2	North Carolina	203,023	127,503,400	8,038,691
3	Virginia	184,334	122,884,900	7,210,195
4	Ohio	71,422	65,957,100	4,864,191
5	Tennessee	71,849	49,157,550	2,748,495
6	Wisconsin	33,830	45,500,480	2,898,091
7	Pennsylvania	27,760	41,502,620	2,959,304
8	Maryland	42,911	24,589,480	438,169
9	South Carolina	25,993	19,895,970	1,297,293
10	Connecticut	10,119	16,930,770	3,074,022
11	New York	11,307	13,958,370	1,172,236
12	Indiana	8,219	6,882,470	445,658
13	Massachusetts	3,826	6,406,570	956,399
14	West Virginia	5,129	3,087,140	228,620
15	Missouri	4,361	3,041,906	218,991
16	Illinois	2,242	1,447,150	85,411
17	Florida	2,056	1,125,600	254,211
18	Georgia	2,304	1,105,600	159,659

The States named produced over 1,000,000 pounds each and grew 99.7 per cent of all the tobacco produced in the United States. Kentucky produced 36.25 per cent of the whole and North Carolina 14.7; Virginia, 14.2. The entire production of the world is estimated to be near 2,600,000,000 pounds annually. The estimated production for the whole of Europe is 500,000,000 pounds. The production of some of the countries is as follows: Germany, 60,000,000 pounds; Austrian Empire, including Hungary, 133,898,000 pounds; Turkey, both in Asia and Europe, 43,000,000 pounds; India, 550,000,000; Cuba, normal crop, 62,000,000 (in 1899 owing to the Spanish-American war, only 24,400,000). Java produces about 53,417,000 pounds annually; Persia, 100,000,000; Japan, 40,000,000. Nearly all the Southern American States raise tobacco to some extent and export from 12,000,000 to 20,000,000 pounds each. France raises between 40,000,000 and 60,000,000 pounds annually, all under government monopoly, as well as that grown in Turkey, Austria and other Regie countries. The Philippine Islands usually grow about 25,000,000 pounds. China raises an immense quantity, but exports but little.

Quantity of Various Types.—Though tobacco is raised in nearly every country, yet with the exceptions of Cuba, Porto Rico, and the Philippine Islands, and possibly Syria, no other can successfully compete with the richness, flavor and other desirable qualities of that grown in the United States. Of the types grown here there are approximately:

Seed leaf and cigar tobacco	179,000,000 lbs.
White burley	140,000,000 "
Shipping or dark tobacco	298,506,806 "
Yellow tobacco	209,989,500 "
Perique tobacco	50,000 "

A large proportion of the tobacco of Maryland, West Virginia and southeastern Ohio is air-cured, and goes under the head of spangled red and air-cured manufacturing tobacco. Of this there are about 25,000,000 pounds. This leaves about 15,600,000 pounds for nondescript, for shrinkage and loss and for consumption on the farms where grown. Several of the States grow from a few pounds up to nearly 1,000,000, which is sold in small quantities and used for consumption at home. In the estimate for the amount of Yellow tobacco no account is taken of the mahogany and red, which are produced in the attempt to grow yellow tobacco. These lower types are included in the estimate for that type.

Exports.—The requirements of foreign countries for American unmanufactured tobacco for the year ending 30 June 1903, in the order of quantity taken, are the following:

	Pounds	Value
United Kingdom	125,430,153	$13,555,279
Germany	59,938,985	5,978,882
Italy	37,536,942	3,767,394
France	31,557,215	2,588,547
Netherlands	24,475,761	1,740,785
Belgium	20,597,933	1,840,043
All other Europe	33,178,530	2,128,576
British North America	12,662,998	1,358,660
British Africa	6,208,662	592,617
Japan	4,429,591	413,337
British Australia	2,967,026	487,682
Mexico	2,801,678	204,836
West Indies and Bermuda	2,468,322	220,493
Other ports of Africa	205,896	1,853,402

A small quantity, less than 2,000,000 pounds in the aggregate, goes to South American states and British Honduras. The total amount of unmanufactured leaf exported for the year 1903 was 368,184,084 pounds, valued at $35,250,893. This is nearly half the amount grown in the United States. The value of the manufactured tobacco exported during the same year was $5,193,196. Each country calls for a special type, though sometimes these types are interchangeable. The United Kingdom calls for high types, among them are the Birds Eye Cutting leaf, Brown Roll wrappers, Spinning leaf, Heavy cutter, Plug wrappers and fillers, Navy leaf, Scotch Elder, and Scotch and Irish spinners. A large part of these go to England in the form of "strips," that is, the leaves with the midribs taken out. The French take three classes, called A, B and C. The A class is 20 inches long, black and oily. Class B is 18 inches long, and Class C 16 inches. Some 7,000 hogsheads of White Burley tobacco come within the French Regie requirements. The Italians take four types, A, B and C, and C 2. Type A is a long smooth shiny leaf, of delicate fibre and dark brown color. It is used as wrappers for cigars. Type B has two sub-types, light and heavy. The heavy has good body, dark brown in color and of more general richness than type A, and it must be at least 22 inches long. This is used in part for the manufacture of snuff. Type B light, is of a reddish color and is used in the manufacture of cigars of light flavor. Type C is a short common leaf 18 inches long used for fillers and binders. Type C 2 is trashy lugs. Austria takes one type, but divided into A, B and C grades. This is a wrapping leaf, very smooth, tough, elastic and of firm and glossy texture. It, as well as nearly all continental shippers, except the White Burley, must be cured by open fires, so as to give it the smoky flavor. Germany, Japan and China take black, strong tobaccos of rather inferior quality, with the exception of the German saucer, which is a rich, mottled leaf, porous, gummy and of fine fibre and stem. Germany also takes a considerable quantity of the spangled tobacco of Ohio and West Virginia and also that of Maryland. This type is deficient in oil, has a medium strength of texture and is air-cured usually, but a small quantity is cured by open fires; in color it is red, red spangled with yellow and fine red. Spain takes the lowest grades. Africa, the longest leaf; Mexico, that most heavily pressed, so that it may be carried over the mountains in bales on muleback.

Imports.— The imports of unmanufactured leaf into the United States for the year ending 30 June 1903 was 34,015,667 pounds, valued at $17,334,449. Of these 5,956,970 pounds were imported from the Netherlands, valued at $4,355,644. This was mainly Sumatra tobacco. There were also imported from Cuba 22,081,413 pounds, valued at $9,966,646. Of the manufactured tobacco and cigars, there were imported during the same year 589,690 pounds, valued at $3,344,671.

Nicotine in Leaf Tobacco.— Tobacco grown under different conditions of soil, climate and mode of cultivation shows varying percentages of nicotine. The following analyses, by Schloesing, will show the percentage of nicotine in the leaves only:

Havana	2.00
Virginia	6.87
Kentucky	6.09
Maryland	2.29

The analyses below were made by Dr. Gideon E. Moore, of New York:

Mexican baler (heavily manured lots)	5.60
Clarksville, Tennessee (heavily manured lots)	5.29
Virginia (heavy English shipping)	4.72
Perique, air-cured (stripped from midrib)	4.25
French Regie, A	3.90
Wisconsin Havana seed	3.8-
Connecticut seed leaf (Hartford)	3.49
Pennsylvania seed leaf (Lancaster county)	3.47
North Carolina yellow	3.15
Mason county, cutting or plug	3.1-
Florida seed leaf	2.38
Little Dutch (Miami Valley)	0.63

The amount of nicotine varies in different samples, even among those from the same locality, and is influenced greatly by the character of the fermentation which the tobacco has undergone, as well as the length of time it has been kept, and the degree of exposure to which it has been subjected. One thing is quite noticeable, that the tobacco bringing the highest prices has generally the least content of nicotine.

Tobacco as a Revenue Producer.— Though used by a greater number of people and among more nations than any other cultivated product of the earth, with the exception of tea, it is the most heavily taxed product of the world. The United States taxes it at the rate of 6 cents per pound in the manufactured product; cigars (large) are taxed $3 per 1,000; cigars (small) 54 cents per 1,000; cigarettes, not weighing more than three pounds per 1,000 of the wholesale value or price of not more than $2 per thousand, are taxed 54 cents per 1,000; large cigarettes, $3 per 1,000. The total collections of revenue from tobacco during the fiscal year ending 30 June 1903, were $43,513,616.85. The United Kingdom levies a tax on unmanufactured tobacco, containing 10 per cent of moisture and over, 77 cents per pound; if it contains less than 10 per cent of moisture, 85 cents per pound. This is from 1,200 to 1,500 per cent on the prices received by the growers. Cigars are taxed $1.215 per pound; snuff, with more than 13 per cent of moisture, 91 cents per pound; with less than 13 per cent, $1.095 per pound. On unmanufactured tobacco, Norway levies a tax of 22.3 cents per pound; Sweden, 12.16 cents per pound; Switzerland, 22 cents per pound; Germany, 9 cents; Holland, 14 cents; Belgium, 5 cents; Russia, 38 cents; France, Portugal, Italy, Spain, Austria, Turkey, Rumania, and Costa Rica are all Regie countries; that is, countries where the governments make a monopoly in the purchase and sale of tobacco. All tobacco intended for government use goes in free. By special permit unmanufactured tobacco may be taken to Austria by the payment of 30 cents per pound, and to France for use of the importer on the payment of $3.15 per pound.

Manufacture of Tobacco in the United States.— The following table shows the amount of manufactured tobacco and the number of cigars and cigarettes made for 13 calendar years:

Year	Manufactured tobacco lbs.	Snuff lbs.	Cigars number	Cigarettes number
1890	243,427,008	9,434,746	4,228,528,258	2,505,167,610
1891	259,855,085	10,674,241	4,422,024,212	3,137,318,596
1892	264,412,767	11,426,927	4,674,708,260	3,282,001,283
1893	238,587,702	11,952,736	4,341,240,981	3,666,755,959
1894	257,050,444	11,582,838	4,163,641,327	3,620,666,804
1895	263,404,840	10,887,709	4,099,137,855	4,237,754,453
1896	248,708,581	12,708,919	4,048,463,306	4,967,444,232
1897	283,320,857	13,768,455	4,431,050,509	4,631,820,620
1898	261,532,298	13,607,631	4,915,663,350	4,385,783,897
1899	279,911,822	14,723,392	5,531,885,085	3,744,975,403
1900	286,901,878	13,805,311	6,177,596,421	3,258,716,305
1901	296,378,074	17,513,317	6,914,639,012	2,728,153,697
1902	328,933,131	18,682,341	6,907,830,553	2,971,360,447

The following will show the number of pounds of tobacco consumed in the manufacture of tobacco, snuff, large and small cigars and cigarettes, for the calendar years given:

Year	Tobacco and snuff, lbs.	Cigars, lbs. (large)	Cigars, lbs. (small)	Cigarettes lbs.	Total pounds
1899	258,975,685	90,972,441	2,774,237	14,418,974	367,139,310
1900	260,683,658	102,561,373	2,833,816	13,084,037	379,162,884
1901	270,571,680	112,889,751	3,498,511	11,079,704	398,039,646
1902	298,348,638	114,955,138	2,434,029	11,816,159	427,553,964

The revenue derived from the tax on manufactured tobacco in the United States for the fiscal years, ending 30 June 1903, is given below:

Year	Cigars large	Cigars small	Cigarettes large	Cigarettes small	Tobacco	Snuff	Total
1900	$19,138,584.82	$646,896.82	$16,014.21	$3,953,177.09	$33,477,244.26	$1,790,090.14	59,022,007.34
1901	20,775,363.73	684,504.05	19,609.89	3,407,433.94	35,292,205.76	2,003,021.32	62,182,138.69
1902	18,311,142.25	410,903.48	31,164.67	2,655,974.88	28,612,644.15	1,696,429.02	51,718,258.45
1903	20,359,171.60	345,869.93	29,041.06	3,009,020.06	18,640,059.20	1,130,455.00	43,513,616.85

Effects of the Use of Tobacco.— Tobacco is a sedative and narcotic and used by more people than any similar substance. Dr. Richardson, in the 'London Lancet,' says of it: "It is innocent as compared with alcohol; it does infinitely less harm than opium; it is in no sense worse than tea and by the side of high living it contrasts most favorably." Norman Kerr, another distinguished London physician, famous for his studies on the effects of narcotics on the human system, says: "No language can accurately describe the comfort enjoyed from a pipe, when exposed to severe weather in trenches, or the power it has to stay the stomach-crave when no food is to be had, and this action of tobacco, under such circumstances, cannot be harmful." Dr. Kerr, after long and patient investigation carried on through years under the most favorable conditions for arriving at the truth, declares that tobacco never impairs or destroys moral capacity or leads to offenses against morality or to acts of criminal violence. "The poison of tobacco," he says, "has effected physical injuries, but appears to leave untouched the conscience and the moral sense." Nor does he believe the habit of using tobacco increases the desire to use other stimulants or narcotics. Indeed, it would seem, from the concurrent testimony of all nations, that among those in which tobacco is most generally used there appears to be the least liability among the inhabitants to contract the habit of using morphine, opium, cocaine, hasheesh and other obnoxious and injurious drugs. So it may, with truth, be said that if tobacco has no other merit, it at least diminishes the desire among those habituated to its use to substitute more deleterious substances in its place.

Bibliography.— Carver, 'Culture of the Tobacco-plant' (1779); Tatham, 'Culture and Commerce of Tobacco' (1800); Watterson, 'A Memoir on the History, Culture, Uses, etc., of the Tobacco Plant' (1817); Brodigan, 'Art of Growing and Curing Tobacco in the British Isles' (1830); Jennings, 'Practical Treatise on Tobacco' (1830); Meller, 'Nicotiana' (1832); Steinmetz, 'Tobacco' (1857); Fairholt, 'Tobacco' (1859); Cooke, 'Tobacco' (1860); Fevre, 'Le Tabac' (1863); Guys, 'Culture of Latakia Tobacco' (1863); Maling, 'Tobacco Trade and Cultivation of the District of Cavalla' (1863); Saxton, 'Handbook of Tobacco Culture' (1863); de Coin, 'History and Cultivation of Cotton and Tobacco' (1864); Dunning, 'Tobacco' (1876); Killebrew, 'Tobacco in Tennessee' (1876); Burton, 'Cultivation of Tobacco' (1877); 'Senseney, 'Tobacco from the Seed to the Warehouse' (1878); Gilmore, 'History of Tobacco' (1878); Ragland, 'Tobacco from the Seed to the Salesroom' (1880); Killebrew, 'Report on the Culture and Curing of Tobacco, United States Census' (1883); Meyer, 'Havana Cigars' (1885); Taylor, 'Tobacco' (1886); Lock, 'Tobacco' (1886); Beale, 'English Tobacco Culture' (1887); Killebrew and Myrick, 'Tobacco Leaf' (1897); Davis, 'Tobacco Culture, North Carolina.'

J. B. Killebrew,
Special Expert on Tobacco for the 10th Census.

Tobacco-pipe. See Pipe, Tobacco.

Tobago, tō-bā'gō, British West Indies, an island of the Lesser Antilles, situated 16 miles northeast of Trinidad. It is about 26 miles long by 7 miles wide, with an area of 114 square

miles. It is hilly, rising at one point to a height of 2,000 feet. The soil is fertile and well cultivated. The chief products are sugar, rum, cocoanuts, cotton, and tobacco. The capital and chief port is Scarborough. The island has been in British possession since 1794, and in 1889 it was united with the colony of Trinidad. Pop. (1901) 18,750.

Tobasco, a meat sauce made of peppers, originally manufactured in Louisiana by Col. John McIlhenny in 1868.

Tobikhar, tō-bĭk-här′. See SHOSHONEAN INDIANS.

To'bit, Book of, one of the Old Testament books rejected as apocryphal by the Jews and Protestants, but received into the canon by the Roman Catholics. It contains an account of some remarkable events in the life of Tobit, a Jew carried captive to Nineveh, and his son, who is named Tobias. Ewald ascribes the book to a Palestinian Jew who wrote in Hebrew, and suggests as the date of its composition the middle of the 4th century before Christ. The earliest known text is in Greek. See BIBLE.

Tobog'gan, a sled formed of a single piece of wood, usually of birch or basswood, curved up and backward at the front end, and used for sliding down slopes of snow. It is commonly from five to eight feet long, about 15 or 16 inches in width if formed of one piece, or wider if formed of two. The curved portion in front is fastened by thongs of hide or gut, and the toboggan is strengthened by cross-pieces of hard wood strapped to the body at short distances. Toboggans originated with the Indians, who used them for hauling packs over the snow, and the name is still applied to a class of sleds drawn by dogs. But the toboggan of to-day is chiefly used in the sport of coasting, a popular pastime in Canada and other countries in high latitudes.

Tobol, tō-bŏl′, Asia, a river of Siberia, tributary to the Irtish, which rises in the southern Ural slopes, in Russian Central Asia, flows northeast, and after a course of 550 miles empties into the Irtish opposite Tobolsk. From the mouth of the Tura it is navigable, but is covered with ice from November to May: its chief affluents are the Uj-Isset, Tura and Tawda. The Trans-Siberian railway crosses the river at Kurgan.

Tobolsk, tō-bŏlsk′, Asia, in Siberia, (1) Capital of a government of the same name, on the Irtish where it joins the Tobol. The principal buildings are the churches, governor's residence, bishop's palace, municipal offices, arsenal, barracks, bazaar and hospital; besides a prison used as a depot for Siberian exiles, assembled from all parts of the country, an episcopal seminary, theatre, gymnasium, etc. The manufactures include bricks, soap and tallow. The trade is unimportant. The town is partly fortified. Pop. (1897) 20,427. (2) The government of Tobolsk, in northwestern Siberia contains an area of 564,825 square miles. The ice sea borders the northern coast; the rivers are navigable when not frozen over. The chief occupation of the inhabitants is agriculture and cattle raising; fishing and hunting in the north. Pop. (1897) 1,438,655.

Tocantins, tō-kän-tēnz′, Brazil, a river rising in the southern part of the state of Goyaz, and flowing north through Goyaz and Pará, emptying into the Atlantic Ocean through the Rio Pará, the southern estuary of the Amazon delta. On the northern boundary of Goyaz the river receives from the left the Araguayá, which is considerably larger than the main stream. The Tocantins is 1,600 miles long, and though interrupted by falls and rapids, it is navigable in stretches aggregating 1,100 miles. Its estuary is 140 miles long, and receives numerous channels from the Amazon, together with which it separates the island of Marajo from the mainland.

Tocqueville, tŏk′vĭl (Fr. tŭk-vēl), **Alexis Charles Henri Clérel de,** French statesman and writer: b. Verneuil 29 July 1805; d. Cannes 16 April 1859. He was originally destined for the military profession, but exchanged it for that of law. In 1827 he was appointed an assistant magistrate at Versailles. In 1831 he was commissioned by the French government to proceed along with his friend M. Gustave de Beaumont, to America, and to investigate and report upon the penitentiary system of the United States. The results of the inquiry were published in 1833 under the title 'Du Système Pénitentiaire aux Etats-Unis et de son Application en France.' This, however, was only the precursor of the greater and more celebrated work 'La Démocratie en Amérique' (1835), to which the Montyon prize of the French Academy was awarded in 1836, and which, by 1850, had run through 13 editions. It was the first systematic analysis of democracy as exemplified in the institutions and political relations of the United States, and was translated into the principal European languages. Tocqueville was in 1839 elected to a seat in the Chamber of Deputies, and ranged himself with the opposition. After the revolution of 1848 he was nominated deputy from the department of La Manche to the National Assembly, where he voted always against the propositions of the ultra-democratic party. In the cabinet of 2 June 1849, he accepted the portfolio of foreign affairs, but resigned it the same year, after holding it for five months. After the *coup d'état* of 2 Dec. 1851, he lived retired from public affairs, and devoted his leisure to the production of 'L'Ancien Régime et la Révolution,' published in 1856. His complete works appeared in 1860–5. Consult: Jaques, 'Alexis de Tocqueville' (1876); 'Souvenirs d'Alexis de Tocqueville' (1893); and D'Eichtal, 'Alexis de Tocqueville et la Démocratie Libérale' (1897).

Tocsin, a bell sounded with quick strokes for the purpose of alarm. The word is derived from the French, and the use of the tocsin as a signal to arouse the people was so common during the French Revolution that the word has come to be proverbially used for any loud sound or call marking the commencement of an important event.

To'dar, Todawar, or **Tuda,** a singular race of people inhabiting the upper part of the Neilgherry Hills in southern India. They are pastoral in their habits and possess a queer unwritten language. Their religion is the worship of the sun and of departed spirits. They follow the practice of polyandry in both its forms — the brothers of one family having one common wife, yet receiving the right, at certain seasons, of temporary husbands to the women of the subject villages. They are a tall, well-

proportioned and finely muscular race of men, are dominant over the neighboring tribes and receive from them a "goodoo" or tribute of one sixth of their crops, the Todars holding aloof from tillage of the soil. They have slowly increased in number since 1858 when a count of them showed only 337, a recent estimate placing their number at 750.

Todd, Charles Burr, American author: b. Redding, Conn., 9 Jan. 1849. His first attempt at authorship was in the writing of the history of his native town which was published in 1880. Later works of his are: 'The Story of the City of New York' (1895); 'The Story of Washington, the National Capital' (1897); 'Cross and Canoe in the Mississippi Valley' with W. H. Milburn (1898); 'A Brief History of New York' (1899); 'The True History of Aaron Burr' (1902).

Todd, David Peck, American astronomer: b. Lake Ridge, N. Y., 19 March 1855. He was graduated from Amherst in 1875 where he became professor of astronomy in 1881. From 1882 to 1887 he held a similar post at Smith College. In order to make astronomical observations he has conducted expeditions to Texas in 1878, to Japan in 1887 and again in 1896, to West Africa in 1889–90, to Tripoli and Barbary in 1900, and to the Dutch East Indies in 1901. He is the author of several text-books on astronomy.

Todd, Mabel (Loomis), American author: b. Cambridge, Mass., 10 Nov. 1858. She edited the 'Poems' (1890–6) and 'Letters' (1894) of Emily Dickinson and a 'Cycle of Sonnets' (1896) by an anonymous author. Her original writings are: 'Total Eclipses of the Sun' (1894) and 'Corona and Coronet' (1898). The results of study of the Ainu aborigines in Kitami province, Japan, appeared in various magazine articles.

Todd's Tavern, Engagements at. The Virginia campaign of 1864 began on 4 May by the advance of the Army of the Potomac across the Rapidan, the cavalry divisions of Gens. Gregg and J. H. Wilson leading. Wilson crossed the Rapidan at Germanna Ford, and marched rapidly by Wilderness Tavern to Parker's Store, from which he sent a reconnoissance toward Mine Run, the rest of his division going into bivouac. During the night he was ordered by Gen. Meade to advance in the direction of Craig's Church, leaving one regiment to hold Parker's Store. Just beyond Craig's Church Wilson encountered Rosser's Confederate cavalry, which was driven back two miles, and at noon, as he had heard nothing of the approach of Meade's infantry, and his own position was threatened, he began to withdraw to Parker's Store, when he heard that the regiment left there had been attacked by Confederate infantry, and that he was cut off from communication with Gen. Meade's infantry. He determined to withdraw on the Catharpin road, by way of Shady Grove Church, to Todd's Tavern, on the Brock road. Before he was fairly on the road he was attacked in heavy force and followed by cavalry, but he reached Todd's Tavern by crossing the Po River at Corbin's bridge. A part of his command was cut off, but came in later in the day. As he approached Todd's Tavern he was relieved by Gregg's division, which, by Meade's direction, Sheridan had sent to assist him, and Stuart's cavalry, which was closely following Wilson, was driven back by Gregg to Shady Grove Church, about four miles. Sheridan was holding the left flank of the army, and covering its trains, while it was grappling with Lee in the Wilderness, and on the 6th had two divisions at Todd's Tavern, covering the roads centring at this point, where he was attacked early in the day by Stuart, who was anxious to get at Grant's flank and his wagon train, but his successive attacks were repulsed. Meade, anxious about his left, directed Sheridan to draw back from Todd's Tavern, closer to the trains, which Sheridan did in the afternoon, and the Confederate cavalry occupied Todd's Tavern. Preliminary to Grant's movement from the Wilderness to Spottsylvania Court House was the necessity to hold Todd's Tavern, which was midway between the two places and on the direct road connecting them; and on the 7th two brigades of Gregg's division and two of Merritt's, dismounted and fighting on foot, attacked Stuart and, after a sharp and closely contested action, drove him from Todd's Tavern, with severe losses on both sides, Fitzhugh Lee's division retreating in the direction of Spottsylvania Court House and Wade Hampton's southward to Corbin's bridge of Po River. Sheridan withdrew and encamped, Gregg's and Merritt's divisions in the open fields to the east of Todd's Tavern. Very early on the morning of the 8th Gregg was put in position to guard the roads from the south, and Merritt's division renewed the engagement with Fitzhugh Lee on the Spottsylvania Court House road to open the way for the advance of Warren's Fifth corps from Todd's Tavern to the Court House. Merritt became severely engaged, but slowly gained ground until about 6 A.M., when he was relieved and Robinson's division of Warren's corps took the advance. Hancock's Second corps, following Warren's, reached Todd's Tavern at 9.30 A.M. and took position covering the Brock road, Catharpin and Spottsylvania roads, and began to intrench, holding the extreme right of the army. At 11.30 A.M. Gen. N. A. Miles' brigade, with Gregg's cavalry brigade and a battery, moved out on the Catharpin road toward Corbin's bridge, and when half a mile from it and 1½ miles from Todd's Tavern, the head of column was opened upon with artillery from the heights on the south side of Po River. Miles formed line, his artillery replied to that of the enemy, there was a skirmish with Wade Hampton's cavalry, which was kept at bay, and at 5.30 P.M., when Miles began to withdraw, he was attacked by Mahone's division of infantry, and fell back fighting to Todd's Tavern. Consult 'Official Records,' Vol. XXXVI. E. A. Carman.

Toddy, a drink made in various tropical countries from the sap of various palms, especially when in a fermented state. In the Malayan Archipelago toddy is the sweet juice of the flower sheaths of *Arenga saccharifera.* In Brazil the majestic buriti, or murichi palm (q.v.), is felled, and cavities are dug in the stem in which to collect the sap, from which a fermented liquor is made. This has led to the use of the name of wine-palm for this tree. The spadix of the useful *Nipa frutescens,* yields toddy which is changed into vinegar by one process, into arrack by another, and may also be converted into

a delicious syrup, thick, frothy, and clear, with a slightly saline flavor. Sugar is made from this syrup by evaporation. The toddy or jaggery-palm (*Caryota urens*), a palm crowned by drooping bipinnate leaves, with wedge-shaped leaflets, furnishes a similar sap when the flowering stems are cut. This, like that of the nipa, can be boiled down into syrup, and will yield a coarse brown sugar known as jaggery or goor. The sap is fermented for the toddy and further distilled for arrack. The cocoanut (*Cocos nucifera*), the palmyra palm (*Borassus flabelliformis*), the date (*Phœnix dactylifera*), and the wild date (*Phœnix sylvestris*), all yield toddy in India, the latter being grown extensively in Bengal, for the sake of this drink and the sugar extracted from it; it is said that the sap can be induced to flow from the upper portion of the stem for many years. The West Africans make their toddy from *Raphia vinifera*.

The word toddy was applied by the Scots to a drink made of whiskey and hot water, sweetened. Whiskey and cold water, properly called grog, is also known by this name.

Toddy Bird, a swallow-shrike (*Artamus fuscus*) of India and Ceylon. It is about seven inches long, of dusky plumage, and is most abundant in wooded districts, especially where palm trees abound, more particularly the Palmyra or toddy palm, from which it takes several of its popular names.

Toddy Cat, one of the civets (*Paradoxurus typus*), common throughout the greater part of India, Ceylon, Burma and the Malayan region, which dwells mainly in the Palmyra or toddy palm-groves. See TODDY.

Tod'hunter, Isaac, English mathematician: b. Rye 1820; d. Cambridge 1 March 1884. He was graduated from London University in 1842 and from St. John's College, Cambridge, in 1848. He was elected a fellow of his college in 1849 and became a lecturer and tutor. He was elected a fellow of the Royal Society in 1862. Todhunter was a man of high attainments in various branches of learning, but is best known as the author of numerous mathematical text-books. His most important works are: 'Treatise on the Differential Calculus' (1852); 'Analytical Statics' (1853); 'Plane Co-ordinate Geometry' (1855); 'Examples of Analytical Geometry of Three Dimensions' (1858); 'Algebra' (1858); 'Trigonometry' (1859); 'The Theory of Equations' (1861); 'History of the Progress of the Calculus of Variations during the 19th Century' (1861); 'History of the Mathematical Theory of Probability from Pascal to Laplace' (1865); 'History of the Mathematical Theories of Attraction from Newton to Laplace' (1873); 'The Conflict of Studies' (1873); 'Laplace's Functions' (1875); 'History of the Theory of Elasticity' (ed. Karl Pearson 1886).

Todhunter, John, Irish poet and dramatist: b. Dublin 30 Dec. 1839. He was educated at Trinity College, Dublin, and after studying at Vienna and Paris, practised medicine for some years in his native city. He was professor of English literature at Alexandra College, Dublin, 1870–4, and later removed to London. He has published among other works: 'Laurella and Other Poems' (1876); 'Alcestis' (1879); 'A Study of Shelley' (1880); 'The Banshee and Other Poems' (1888); and several plays, such as 'Helena in Troas' (performed 1886); 'The Prison Flower' (performed 1891); 'A Comedy of Sighs' (performed 1894).

Todleben, tōt'lā-bĕn, or **Totleben, Franz Eduard Ivanovitch,** COUNT, Russian general: b. Mitau, Courland, 20 May 1818; d. Soden, Germany, 1 July 1884. He studied at the College of Engineers at Saint Petersburg, and entered the Russian army during its operations against the Circassians in 1848. Having been recognized as a most able engineer in this campaign, he was sent to the Crimea in 1854, where he distinguished himself while under constant fire from the guns of the enemy in the rapid conversion of the city of Sevastopol into a formidable fortress. For this and other valuable service during the Sevastopol campaign he was promoted to the rank of general. At the close of the Crimean war he retired to private life, where he devoted himself to scientific investigation and to the writing of a history of the war. During the Russo-Turkish war of 1877 he was sent to Plevna, where he compelled the commander, Osman Pasha, to surrender his entire army to the Russians. He was afterward made commander-in-chief of the army at Constantinople. At the end of the Russo-Turkish war he entered political life, and was in his later years governor, first of Odessa, and afterward of the province of Wilna. He published an account of the defense of Sevastopol (French translation 'Défense de Sevastopol' 1804). Consult: Kinglake, 'The Invasion of the Crimea' (1863–87); Brialmont, 'Le général comte Todleben' (1884); Krahmer, 'General-adjutant Graf Todleben' (1888).

Todmorden, tŏd-môr'dĕn, England, a town in Lancashire and Yorkshire, on the Calder, 21 miles northeast of Manchester. The churches of various denominations, town-hall, free library, technical school, etc., are the chief buildings. The industries consist of foundries, machine-works, and manufactories for cotton goods. Pop. (1901) 25,419.

To'dy, a term applied to a family (*Todiidæ*) of birds closely related to the motmots and kingfishers. They are distinguished by the long flat bill, short and rounded wings and short and square tail. Only four species are known, all of small size, and inhabitants of tropical America. The green tody (*Todus viridis*) of Jamaica is about four inches in length, and green on the upper parts, the flanks rose-colored, the throat scarlet, and the belly pale yellow. The bill is red. It frequents the trees along watercourses, and has the habits of a fly-catcher, taking short flights in pursuit of insects and returning to the perch. They nest in the manner of kingfishers, in holes excavated in banks, and lay 3 or 4 white nearly spherical eggs. Consult Evans, 'Birds' (New York 1900).

Toft, an old English word denoting a thicket of trees; a homestead; or a piece of ground on which a messuage or home formerly stood. Taken in the second sense toft was frequently used in legal papers in conjunction with the work croft, a "toft and croft" meaning a house and homestead, with the stables and outbuildings, the whole surrounded by a thicket or enclosure. Probably from the fact that the house was usually surrounded by trees came the later meaning of toft, which is preserved in the modern word tuft, a grove of trees.

Toga. See COSTUME.

Togo, Heihaichiro, Japanese admiral: b. Satsuma, Japan, 1857. He very early became known as one of Japan's most daring naval officers, and a few years before the annexation of the Hawaiian Islands by the United States, he was sent to Hawaii in command of the battleship Naniwa to protect the Japanese who were then complaining of persecution by the government. There he nearly became involved in warfare with United States ship Boston whose captain supported the demand of the Hawaiian government for the surrender of an escaped Japanese prisoner, and threatened to fire upon the Naniwa. When Togo immediately cleared his ship for action, however, the captain of the Boston apologized and withdrew his threat. In 1895 Togo practically began the war with China by firing upon Chinese transports carrying troops with an evidently hostile purpose. On the breaking out of the Russo-Japanese war in 1904 he was appointed commander-in-chief of the Japanese navy and conducted the operations against Port Arthur, and the bombardment of that port, defeated the Russian fleet there, driving it back, after severe fighting, to the shelter of the inner harbor, and damaging several Russian ships. On 27–8 May 1905 he met and annihilated the Russian Baltic Squadron, only four small cruisers and some torpedo boats escaping. See MANCHURIA.

To'goland, Africa, a German possession on the Gulf of Guinea, between French Dahomey and the British Gold Coast. It has a coast line of only 42 miles, but extends 325 miles inland, where it becomes a little broader. Area, 33,630 square miles. The coast is low and bordered by lagoons, but the interior is crossed by the escarpment of the Sudan plateau. The country is well watered, the interior by branches of the Volta, which forms the west boundary. The chief products are palm oil, copra, rubber, indigo and woods. The inhabitants, who number about 2,000,000, are Sudan negroes. In 1902 there were 159 Europeans, 149 being Germans. Commerce is rapidly increasing, and there is regular steamship connection with Hamburg. Togoland was declared a German protectorate in 1884.

Togue, a local name in Maine for the lake-trout (q.v.).

Toilers of the Sea ('Les Travailleurs de la Mer'), a novel by Victor Hugo, published in 1866. The scene is laid in the Channel Islands and the book is dedicated to the "Isle of Guernsey, severe yet gentle, my present asylum, my probable tomb."

Toise, toiz, in the French system of measures used previous to the decimal system, was the unit of linear dimension. It consisted of six pieds, or feet, each of which was composed of 12 pouces, or inches, each pouce being divided into 12 lignes, or lines. The toise was thus the equivalent of 1.94904 + metres or of 6.3946 + English feet.

Tokat, tō-kät', Asia Minor, a town in the vilayet of Sivas, 70 miles from the Black Sea. It extends between steep rocky walls in a labyrinth of narrow streets bordered by miserable houses. It contains a large mosque, bazaars, foundries, and manufactories of carpets, silk, wool and cotton goods, etc. The Armenians live in its southern section. The town was formerly more prosperous than at present. Pop. 29,900.

Tokay, tō-kā' (Hungarian, tō'koi), Hungary, in Semplin County, at the junction of the Theiss and Bodrog, 130 miles northeast of Pesth. Its buildings include a theological seminary, gymnasium, high school, etc. In the neighborhood are rich mineral deposits, as salt, sapphires, etc. The chief occupations are agriculture, fishing, viticulture, and timber-trade. The Tokay wine is famous, and the best is produced on the hill of Mezés-Máli. Great care is exercised in the culture, gathering, and selection of the grapes. The wine is of various qualities, dependent finally upon the amount or lack of artificial pressure. The best kinds are the *Essence* and the *Ausbruch*, of amber color when new, turning green with age. There are 34 wines, grouped as sweet and dry; 2,000,000 gallons are produced, but the celebrity of the wine is such, that many imitations are made by French and German dealers, which are even sold in Hungary. Pop. (1901) 5,110.

Token Money, a name in numismatics applied to pieces of money current only by sufferance and not coined by the authority of the state or government. In England in the 16th century the national coinage was so unsatisfactory and inconvenient that large numbers of private traders and merchants were impelled to have halfpence and farthings manufactured for themselves. These "tokens," as they were called, were made of lead, pewter, latten, tin, and even leather, and could only be made use of as currency at the shops or warehouses of their respective issuers. Notwithstanding the endeavors made during several reigns to put a stop to the circulation of this unauthorized coinage, traders' tokens continued to multiply to an astonishing extent, until, in 1672, a proclamation was issued, prohibiting their making or use under severe penalties. From that date until 1787 the issue of private tokens entirely ceased; but in the latter year, owing to the great scarcity of government copper coins, the Anglesey Copper Mines Company struck and put into circulation some 300 tons of copper pence and halfpence. The bold example thus set was speedily followed by other trading firms all over the kingdom, and again the government found it necessary to take action in the matter, which it did by issuing a new national copper coinage. For some years the issue of private tokens was thus effectually checked; but in 1811, the authorized coinage again getting scarce, the copper companies and others recommenced the issue of batches of tokens. This went on until 27 July 1817, when the manufacture was prohibited by act of Parliament, and all tokens in currency ordered to be withdrawn from circulation by 1 Jan. 1818.

In the United States small coins became so scarce in 1862 that tokens made their appearance in large quantities. They were of two classes, war or patriotic tokens, and trade or advertisement tokens. Both kinds were issued with a mercantile view, since they passed for a cent and could be manufactured (in sufficient quantities) for much less. Cards and tokens appeared during 1862, 1863 and 1864. Of the patriotic or war tokens there were something like 400 varieties coined, including mulings and different metals, the latter largely re-strikes. Of original pairs of obverse and reverse there must have been less than 200. The common varieties bore the inscriptions "Army and Navy," and

ADMIRAL TOGO

OF THE JAPANESE NAVY.

"Not One Cent." The first coinage of trade tokens, or store cards, as they were sometimes called, took place in Cincinnati where nearly 900 varieties were issued, fully three times as many varieties as any other city issued except New York. A number of other western cities soon followed the example of Cincinnati, but it was not until the early part of 1863 that New York began to issue the famous Lindenmuller cents, of which there were more than a million coined; these were followed by the Knickerbocker tokens, consisting of many varieties. Altogether there were between 600 and 700 varieties issued from New York. Ohio issued about 1,300 varieties from 100 different cities and towns, more than any other State issued; New York State comes next after Ohio, with over 900 varieties. New Jersey had but few, and Pennsylvania not many; chiefly from Philadelphia and Pittsburg. Detroit furnished as many advertisers as New York, and the rest of Michigan nearly as many as Cincinnati. Indiana had about a hundred; Illinois, including Chicago, not as many as Indiana; and Wisconsin nearly twice as many. When the government stopped the coinage of tokens in 1864 there were upward of 20,000,000 in circulation.

Tokio, tō'kē-ō, or **Tokyo,** the capital of Japan, situated at the head of the land-locked Bay of Tokyo, on the east coast of central Hondo, and at the mouth of the Sumida Gawa. Besides the latter river, which divides the city into two unequal parts, Tokio is intersected by a large number of canals, which are generally crossed by wooden bridges. Some of the canals form concentric courses, enclosing a number of islands, one within the other; and on the innermost of these stands the imperial palace. This large cluster of buildings is surrounded by magnificent gardens, and enclosed by high walls and fosses. On the outer islands are most of the government departments and foreign legations. Surrounding these central islands, the city spreads out on all sides, with a rather irregular and complex street plan. There are numerous parks in and around the city, some of them being large and beautiful. Practically all the houses are built of wood. Besides the palace the only notable buildings are some of the numerous temples, especially that of Kwannon, and the temple of the Shoguns. There are six European churches, the finest being the Russian cathedral. An excellent system of elementary education, and many higher schools are maintained. The imperial university has six faculties and over 3,000 students. Tokio has a water system, street railways, electric and gas lighting, good macadamized roads, and public libraries, public works, transportation, education, and sanitation being carried on according to methods of civilized cities all over the world. The municipal council, the members of which are elected in the same way as in Berlin, lost several opportunities for monopolizing gas and electric-light plants, street railways, and markets, owing to ignorance of the subject of municipal ownership of monopolies, but a movement is in progress toward municipalization of these various utilities. At present the water system is the only one owned by the city. Although the principal railroad centre of the empire, Tokio is not an important manufacturing or commercial city. Its port is Yokohama, near the entrance to the bay. The city was founded in 1456, and in 1590 it became the capital of the Shoguns, the emperors residing at Kioto. With the downfall of the Shoguns in 1868, Tokio (till then known as Yedo) became the residence of the emperors and the sole capital. It has several times suffered severely from earthquakes. Pop. (1901) 1,440,000; including the *Fu,* or district, 1,910,483.

Tököly, tē'kēl-yĭ, or **Tökely, Emerich,** Count, Hungarian patriot: b. in the castle of Kasmark, Zips, 1656; d. near Ismid, Asia Minor, 13 Sept. 1705. He was the son of a Hungarian nobleman, at whose death he engaged in the Magyar insurrection. He distinguished himself as a patriot and soldier in the struggle against Austria, and was created Prince of Transylvania by the Turkish allies of the Magyar insurgents. In 1686 he was given command of 9,000 Turkish soldiers. But he found few adherents on his return to Hungary and in 1688 was defeated by General Heusler over whom, however, he was enabled to claim a victory at Yernesi in 1689. He took a prominent part in all of the later operations of the Turks in this campaign, and was never pardoned by the imperial government. After the peace of Karlowitz in 1699 he lived at Constantinople, and on the estate given him by the sultan on the other side of the Bosporus.

Tokushima, tō-koo-shē'ma, Japan, the capital of the prefecture of the same name, and the largest city on the island of Shikoku, situated on the northeast coast. It is an important steamship station. Pop. (1899) 61,501.

To'land, John, English writer: b. near Londonderry 30 Nov. 1669; d. Putney 11 March 1722. He was brought up as a Roman Catholic, but at 16 went over to Protestantism. He was educated at the University of Glasgow, and studied divinity in the University of Leyden. In 1696 he published a work entitled 'Christianity not Mysterious,' which may be regarded as opening the prolonged English controversy between deism and orthodoxy. The House of Commons ordered it to be burnt by the common hangman, and Toland met with determined opposition from many quarters, though Locke gave him a certain amount of support. He subsequently supported himself by literary hack-work and various forms of political party service. Besides the work above mentioned he wrote a 'Life of Milton' (1698), in an edition of his prose works; 'Memoirs of Denzil, Lord Holles' (1699); 'Anglia Libera' (1701), a defense of the Act of Succession; and 'The State Anatomy of Great Britain,' etc. (1717).

Toledo, tō-lē'dō, Iowa, city, county-seat of Tama County; on the Chicago Northwestern railroad; about 65 miles northeast of Des Moines and three miles from Tama (q.v.), a railroad junction on the Iowa River. It was settled in 1844. It is in a fertile agricultural region in which there is considerable attention given to stock-raising. The industries are connected chiefly with the farm products. The principal public buildings are the county court-house, jail, the churches and schools. The educational institutions are Western College (U.B.), opened in 1856; a Government Indian Industrial School, public schools, and a library. There are two banks. The government is administered by a mayor and a council composed of six members. Pop. (1890) 1,836; (1900) 1,941.

Toledo, Ohio, city, county-seat of Lucas County, on the Maumee River, near its mouth; lat. 41° 30′ N., lon. 83° 32′ W. The city is 587 feet above sea-level. It is 96 miles west of Cleveland, 124 miles north of Columbus, and 234 miles east of Chicago. The northern corporation line is within two miles of the Michigan boundary. The city lies on both sides of the Maumee River, the principal business section being on the left bank; it extends from the river mouth, where the stream opens into Maumee Bay, to a point nine miles up stream. The area of the city is 28.57 square miles.

Municipal Conditions.— The slope from the river on both sides is gradual, but amply sufficient to insure good drainage. It is well laid out, with wide streets. These aggregate 390 miles in length, of which 375 miles are sidewalked, 256 miles electrically lighted, and 148 miles are paved, chiefly with stone and asphalt. The residence streets are all beautifully shaded, and the absence of all fencing gives this section a park-like appearance. The sewerage system is excellent, there being a total of 143 miles, all emptying into the Maumee River. The waterworks originally cost about $1,400,000, and has a capacity of 45 million gallons daily, with 154 miles of street mains. The city is supplied with natural gas brought from three fields, Northwestern Ohio, Central Ohio, and West Virginia; and there are 17,000 consumers, the gas being used only for household purposes. The electric car system is very complete, covering 110 miles of streets, and accommodating all sections of the city. There are six distinct interurban electric roads in addition, with freight and passenger stations in the business centre. They have a total of 400 miles of track, connecting Toledo with a large number of surrounding cities and villages, including Cleveland and Detroit.

Parks.— The park system of Toledo embraces a total of 848 acres; beginning at the city limits up the river on the west side is Walbridge Park, 62 acres, on a bluff 75 feet high, with an unrivaled river view; Ottawa Park, on the western side of the city, 280 acres; Central Grove Park, 100 acres; Bay View Park, 202 acres, at the point where the river empties into the bay. Further up the river on this side is Riverside Park, 63 acres, fronting the stream. On the east side are Collins Park, 70 acres, and Navarre Park, 53 acres. Besides these, there are 23 smaller parks and triangular spaces, ranging from one eighth of an acre to seven acres in area. The large parks are connected by a boulevard, which is ten miles long on the west side, 150 to 200 feet wide, now under construction, extending in a semi-circle from Walbridge to Bay View parks, the most of the necessary land being donated by property owners. On the east side, a similar semi-circle is projected and partially completed. In Ottawa Park is a public golf course, considered one of the finest in the United States.

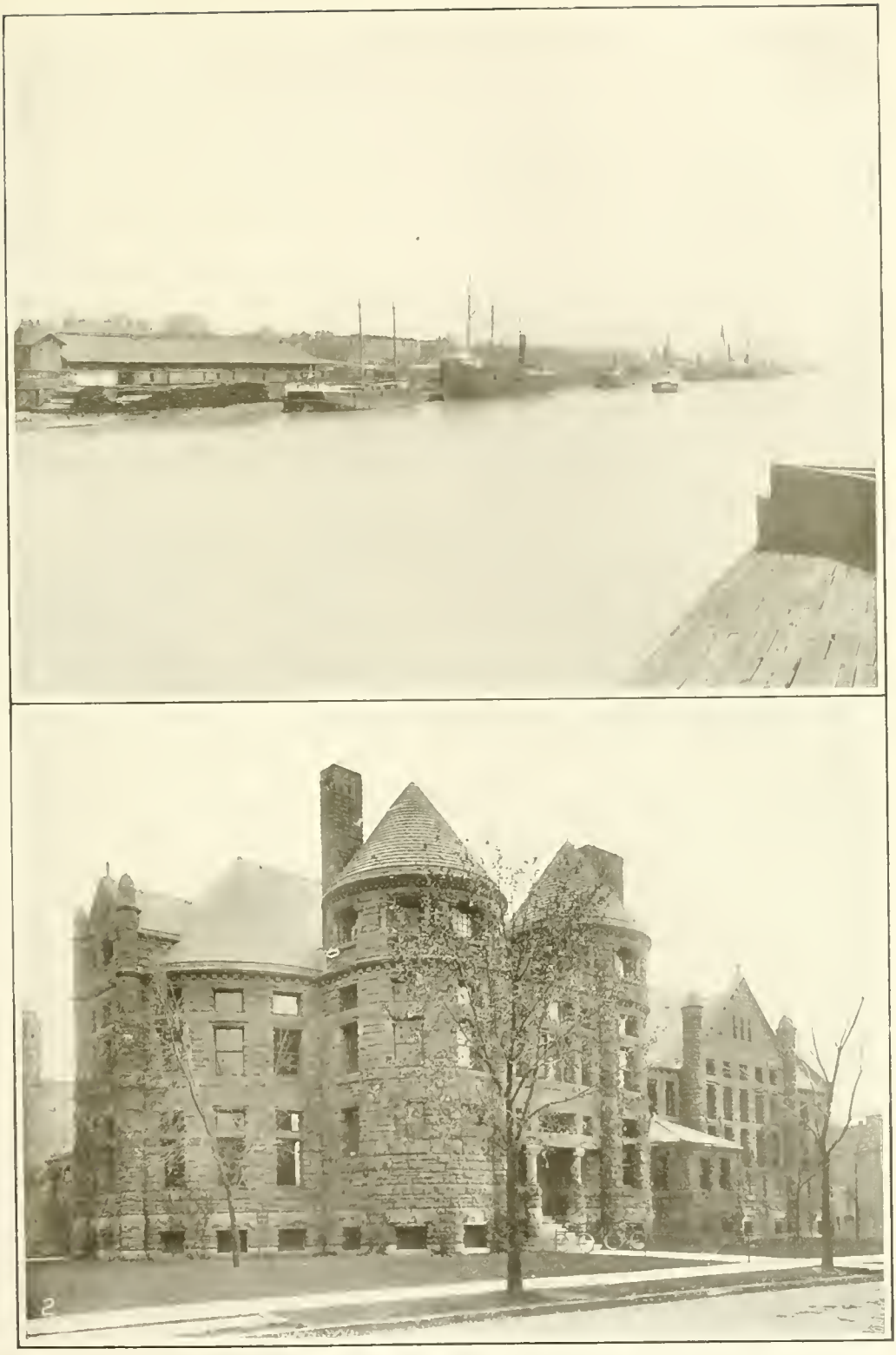
Buildings.— Among the notable buildings are the court-house, in front of which is a fine bronze statue of President McKinley, erected in 1903; the Y. M. C. A. building; the Masonic Temple; a soldiers' memorial building; armory of the Ohio National Guard; the public library (which has 50,000 volumes and five sub-stations); the Valentine theatre, one of the finest and most artistic interiors in the United States, and many modern office and business blocks.

Churches and Schools.— There are 91 church edifices in the city, nearly all having Sunday-schools. Some of the rooms devoted to the latter are up to the best modern standards in plan and equipment. Nearly all have large libraries for the use of the scholars. There are two public high schools and a manual training school, which occupies a large structure annexed to the central high school. Its foundation was a bequest of the late Jesup W. Scott. There are 42 public school buildings, besides 16 parochial schools belonging to and controlled by the Roman Catholic Church. The latter church also supports an academy under the Ursuline Nuns, a similar school by the Notre Dame Sisters, and St. John's College, an institution for boys and young men, under the direction of the order of Jesuits. There is a city normal training school, to prepare teachers for the city schools; 10 private schools; two large business colleges, one of which has 500 students; and the Toledo Medical College, a flourishing institution. The Museum of Art is an organization for the advancement of art, numbering in its membership the most progressive citizens. It occupies a building remodeled for its purposes, and is gradually acquiring a valuable gallery of paintings and objects of art.

Charities.— Among the benevolent and philanthropic institutions are the Toledo State Hospital for the Insane, supported by the State. This is an institution on the cottage plan, with accommodations for 1,700 inmates; the Toledo hospital, a large institution supported by the voluntary contributions of citizens; Saint Vincent's Hospital and Orphans' Home, conducted by the Gray Nuns; Lutheran Orphans' Home; Old Ladies' Home; a Roman Catholic hospital for the aged, conducted by the Little Sisters of the Poor; the County Children's Home; the Y. M. C. A. and Y. W. C. A.; the day nursery, a home for foundlings, training school for nurses, and a number of private hospitals.

Commerce and Transportation.—The location of Toledo, at the western end of Lake Erie, gives it great commercial advantages, for it is at the head of the direct lake route eastward. The distance by lake to Chicago is 691 miles, while it is but 234 miles by rail. Hence there is an enormous traffic between the eastern cities and the region lying southwestward, of which Toledo is the distributing point. This natural advantage is supplemented by the railway system, the city being the centre of 14 trunk lines, making direct communication to the Atlantic on the east and the Pacific on the west, with direct lines north and south. These trunk lines, including their branches, give a grand total of 27, making Toledo second only to Chicago in the number of railroads. All of the trunk roads reaching the city have dock facilities, with regular steamer connections to all important lake ports.

The location of Toledo makes it the most convenient shipping point for a large portion of the "winter-wheat belt," and it is one of the most important primary grain markets of the United States, after Chicago. It has 12 grain elevators, with a storage capacity of 8,500,000 bushels. The grain, brought by rail, from the interior, goes eastward by lake to Buffalo, and thence to seaboard. Toledo is the leading clover-seed market of the world and its quotations govern



1. The Maumee River at Toledo.
2. The Toledo Public Library.

the prices of clover-seed for the United States. In 1900, Toledo received over 55,000,000 bushels of wheat, corn, rye, oats and barley.

Toledo is one of the largest shipping ports for soft coal in the world. This comes by rail from the mines of West Virginia, southern and eastern Ohio, and Pennsylvania, and is transported by water to all ports on the upper Lakes. The Ohio Central, Hocking Valley, and Pennsylvania railroads have immense docks on the river front, with steam apparatus by which a carload of coal at a time is shot into the holds of a vessel. Similar appliances are used for the rapid unloading of iron ore coming from the Lake Superior mines, which is shipped by the same roads to the iron furnaces in southern Ohio, to mix with the native ores, thus producing a superior quality of iron and steel. There is also a very large trade done in lumber, salt, etc., Toledo being the largest distributing point on the Lakes for coal, ore and lumber.

The harbor of Toledo lies entirely within the Maumee River, giving full protection to shipping. The Maumee is really a wide and deep estuary of Lake Erie, to the foot of the historic "Rapids of the Maumee," just above Perrysburg, the site of Fort Meigs, famed for Harrison's defense in 1813. Above this the river passes for some 15 miles over outcrops of limestone. At the northern city line, the river opens into Maumee Bay, which is three miles north and south by six miles east and west. Through the bay, the United States government has dredged a straight channel, 400 feet wide by 21 feet deep, and eight miles long from the mouth of the river. The harbor proper embraces the wide channel of the river, which is 700 to 1,400 feet wide between the harbor lines established by the government. The channel of the stream has been improved by the government to the same depth and width as the straight channel. The cost of this channel through the bay, and the corresponding river improvements, has been over $2,000,000. The wharfage space covers both banks of the river the entire length of the city, 18 miles in all, besides several miles on Swan Creek, a deep tributary which enters the river in the middle of the business section. Besides these, there is unlimited wharf capacity along the shores of the bay, to be utilized eventually.

Manufactures.— The advantages of Toledo as a distributing point by lake and rail, its proximity to raw material and fuel, have caused its industrial interests to dominate all others. As an example of this, the fact that the renowned Lake Superior iron ores, the coal and coke from the Ohio fields, meet at its wharves on a common basis of economy, resulted in the building in 1903–4 of a blast furnace and steel plant on the river front, by the Toledo Furnace Company, with a capacity of 400 tons per day, and costing $3,000,000. Other great industrial establishments are the Edward Ford Plate Glass Company, the largest establishment of the kind in the country, $2,000,000 capital; the Milburn Wagon Company, the second largest wagon manufactory in the world, $800,000 capital; the National Malleable Castings Company, $3,000,000 capital; the Pope Motor Car Company, $2,000,000 capital, manufacturing automobiles; the National Milling Company, $400,000 capital, with the largest winter wheat mill in the United States; the Libbey Glass Company, devoted to the production of fine art glass, capital $125,000; the Ames-Bonner Brush Company, capital $400,000; the Dewey Stave Company, capital $300,000; the Woolson Spice Company, capital $300,000; and the J. M. Bour Company, capital $100,000, both devoted to ground coffee and spices; the Toledo Computing Scale Company, $600,000; and many others of less magnitude. The facilities for distribution naturally make Toledo a centre for the wholesale and jobbing trade. The lines of largest importance are groceries, dry goods, tobacco, hardware, etc.

By the government census of 1900 the city's bicycle industries had an invested capital of $1,526,993, employing 912 men, with an annual output valued at $1,583,450. The wagon and carriage factories had a capital of $1,817,369, with products of almost a million dollars a year. The capital of its flouring mills was $1,268,870; annual cost of raw material, $4,033,921, and value of the products, $4,458,749. The 27 foundry and machine shops had $1,945,058 invested, with 1,991 employees, to whom was paid annually $970,143; the cost of material was $2,715,613. There are six malt liquor establishments, 15 lumber and lumber mill product factories, and three petroleum refineries. In all Toledo has (1904) 1,162 industrial establishments, representing an investment of over $32,000,000, and employing over 21,000 people, with a monthly payroll of $950,825. The manufacturing interests increased 100.5 per cent in the decade from 1890 to 1900.

Banks.— Toledo has six national banks, aggregate capital, $2,250,000; surplus and undivided profits, $2,879,000; deposits, $11,531,500; and 15 private and savings banks, aggregate capital, $3,100,000; surplus, $900,000; deposits, $8,838,000. The government report of 1900 gives the net debt of the city $6,526,204, the assessed valuation of the real and personal property $53,445,760, and the rate of taxation $32.60 per $1,000. The total receipts were $2,158,872, and the expenditures for maintenance and operation $1,484,588.

Population.— The population of Toledo by the census of 1850 was 3,829; in 1860, 13,768; in 1870, 31,584; in 1880, 50,137; in 1890, 81,434; in 1900, 131,822. The increase for the past federal decade was over 61 per cent, the largest ratio of gain of any city of its population or larger, in the United States. The discovery of natural gas and petroleum in northwestern Ohio in 1887 was one of the contributing causes, for Toledo is the natural metropolis of the oil area, and this business remains a potent factor in the prosperity and growth of the city.

This rapid growth in population caused the rapid expansion of the best residence section of Toledo. On the western side of the city is this new area, with many miles of streets lined with modern residences of the best class, all erected since 1888. This then was largely forested, and in building, as many of the original trees were preserved as possible, thus adding much to the beauty of streets and lawns. The excellent drainage and the wide streets, open to the breezes, are among the factors which make Toledo one of the healthiest cities in the Union. The death rate for 1000 was 12.31 per 1,000; for 1903, 12.26 per 1,000.

Government.— The city government comprises a mayor, with a two-year term; a city council, composed of one member elected by each of

the 13 wards, three members elected at large, and a president, also elected at large, but who has no vote except in case of a tie; an appointed board of public service, of three members, which has charge of all expenditures for streets, sewers, bridges, wharves, parks, boulevard, cemeteries, waterworks, workhouse, and markets; an appointed board of public safety of five members, and the mayor ex-officio, in charge of the police and fire departments; city solicitor, city auditor and city treasurer.

History.— The Maumee River was one of the most important routes for travel by the Indians and the white traders. Going by canoe to a point near Fort Wayne, Ind., a portage of a few miles enabled them to reach the headwaters of the Wabash, which they followed to the Ohio and thence to the Mississippi. Another important route was up the Maumee and the Auglaize, a southern tributary, thence by portage to the headwaters of the Great Miami, which reaches the Ohio just below Cincinnati. An important Indian trail also crossed the river at the rapids above the city, by which hunting parties went to Kentucky.

A few French Canadian hunters and trappers settled, in the 18th century, at points within the present site of Toledo; but there is no reliable account of the earliest sporadic settlement of Americans on the city plat. In 1805, a treaty was made between the United States and the Indians, at a stockade, named Fort Necessity, which stood on a high clay bluff at the junction of Swan Creek and the Maumee. By this, the red men yielded title to the "Fire Lands," granted to the citizens of Groton and New London, Conn., in recompense for the burning of these towns by the British in the Revolution.

In 1817 a company of speculators laid out a town at the mouth of Swan Creek, called Port Lawrence. Very few settlers came, however, and the hamlet languished. In 1832, another settlement, named Vistula, was begun by Major Stickney, for many years Indian agent, a mile further down the river, at the foot of what is now Lagrange street. This spurred the owners of the land at Port Lawrence to new efforts; and a brisk rivalry sprang up between the two villages. The two were wisely consolidated in 1833. A public meeting of the citizens of both was held to determine the name of the united town; and, at the suggestion of Willard J. Daniels, the name of Toledo was adopted. He had been reading a history of Spain, and urged the name of the old Moorish capital for the reasons that there was no town of that name in America, that it has a pleasant sound, and is easily pronounced. Toledo was incorporated as a city in 1846.

The town had slow growth until the opening of the Wabash and Erie Canal, from Toledo to the fertile Wabash Valley in Indiana, in 1843, and of the branch from Defiance south to Cincinnati, called the Miami and Erie Canal, which was opened for traffic in 1845. In 1846 these two canals brought to Toledo products valued at $3,000,000, while those going from Toledo to points on both aggregated nearly $5,000,000. The first railway to reach Toledo was called the Erie & Kalamazoo, which was opened from Toledo to Adrian, Mich., in 1836, the cars being drawn by horses. The next year a locomotive was put on the line, and a contract for carrying the mails was obtained from the government. The road was sold by the sheriff in 1842, and its line is now part of the great Lake Shore system.

S. S. KNABENSHUE,
Associate Editor 'Toledo Blade.'

Toledo (Sp. tō-lā'thō), Philippines, pueblo, province of Cebu: on the west coast; 20 miles west of the pueblo of Cebu. Petroleum and natural gas are reported in the vicinity. Pop. 10,922.

Toledo, Spain, in New Castile, capital of a province of the same name, on the Tagus, 55 miles southwest of Madrid. It is the archiepiscopal see of the primate of Spain. The city is walled, and occupies an acclivity, around which rise lofty mountains. The city is built compactly, houses crowded, streets steep, winding and narrow. The chief points of interest are the Alcazar (1551), once including fortress and palace, which occupies a central and high point of the town; the great Gothic cathedral (1227–1493), a most imposing edifice of great architectural merit, which has seen many vicissitudes, but retains some fine stained glass and a choir of marvelous beauty. The large square of Zocodoven is the fashionable promenade, and thoroughly Moorish in character. Here the heretics were burned, and the bull-fights take place. There are besides a theological seminary, monastery, several palaces, and hospitals. The manufactures comprise the famous Toledo sword-blades, small-arms, church ornaments, and vestments, silk, wool, and cotton textiles, and confections. Toledo was the ancient capital of all Spain and important in the country's history. It was taken by the Romans 193 B.C.; and subsequently was occupied in turn by Goths, Moors, and Castilian monarchs. It was also the seat of the Inquisition (q.v.). The town is now sadly decadent. The Alcazar, so often damaged by fire, has been restored with considerable expense. Pop. (1897) 23,465.

Toledo War, The, a name popularly given to the contest over the division line between Michigan on the north and Indiana and Ohio on the south. It arose out of an error in the location of the southern point of Lake Michigan. In 1805 the Territory of Michigan was organized in conformity with the Ordinance of 1787, which provided that the line between Ohio, Indiana, and Illinois on the south, and the territory on the north, should be "an east and west line running through the southern point of Lake Michigan." This was set down on the maps of the times 42° 32′ N., but when Michigan was organized it was found that the true line through the southern point of Lake Michigan was 65 miles to the south, or 41° 37′ 19″ N., and this more southerly line was adopted. But when Indiana and Illinois were organized as States, the northern line was adopted, and there was thus left a belt 65 miles broad claimed by both factions. Congress ordered a survey, which was completed in 1817, establishing the "Harris" line, near the northern one. But the people of Michigan protested vehemently, as the city of Toledo was in the disputed belt. In 1836 Ohio by act of Legislature organized townships in this territory, which had long been under the control of Michigan. Then both Michigan and Ohio appealed to President Jackson, but got no relief. The governor of Ohio called out the militia, the gover-

nor of Michigan did likewise and occupied Toledo. When it seemed as if a conflict could no longer be prevented the matter was settled by the admission of Michigan to the Union as a State upon condition of her acceptance of the "Harris" line, and giving her in recompense the northern part of the peninsula of Wisconsin. Great deposits of copper and iron being found in this peninsula, Michigan accepted the conditions and entered the Union as a State, 26 Jan. 1837. See UNITED STATES, WARS OF THE.

Toleration, a word meaning in its general sense forbearance without approval, as when a state has an established church, but other churches are tolerated — that is, their members are permitted to worship in their own way without interference on the part of the state. In this meaning toleration is different from the system of voluntary support of all churches without a state religion. It was much used in America, however, in a narrower, or perhaps a broader sense, during the struggle to put an end to the compulsory support of Congregational churches by the taxpayers in certain New England States, especially Connecticut. Toleration is now universal in civilized countries, so far as permission to worship is concerned, but some restriction still exists as to bell-ringing by Roman Catholics in Sweden, and there is a certain degree of intolerance toward Protestants in some South American republics. Nowhere, however, in any country pretending to civilization, is persecution on account of religious belief permitted by law.

In all ages enlightened minds have favored toleration. It was the rule among the ancient Greeks, and also among the Romans, until religion became so identified with state affairs that refusal to accept the state religion was treason to the government. Toleration was unknown in practise during the Middle Ages, although it had earnest advocates among Christians, Mohammedans and pagans. In modern times toleration has been a growth of the past three centuries. As late as the early part of the last century men were imprisoned in New England for refusing to pay taxes for maintenance of the local church. England removed Roman Catholic disabilities in 1829, but did not admit Jews to Parliament until 1858. Russia and Rumania still persecute Jews and Roman Catholics and dissenters from the Orthodox Russian Church are subjected to systematic injustice in parts of the empire. The Russian government professes to extend absolute toleration, but prohibits proselytizing, and this is made the pretext for the harshest measures toward non-orthodox creeds. In a legal sense toleration is now co-extensive with civilization and semi-civilization, but education only can make it effective by causing a fraternal and tolerant spirit to take the place of intolerance and fanaticism, wherever the latter prevail.

Toleration Act, a statute of William and Mary, under which freedom of worship was granted to Protestant dissenters from the Church of England, provided they made a declaration against transubstantiation, and took the oaths of allegiance and supremacy. See TOLERATION.

Tólima, tō-lē'mä, Colombia, a volcano rising from the central cordillera of the Colombian Andes to a height of 18,320 feet.

Toll, a tax paid or a duty imposed for a privilege granted, such as: the payment claimed by owners of a port of entry for the privilege of landing or shipping goods; the fee exacted by those who erect or maintain a bridge for the privilege of passing over the same, a portion of grain retained by the miller as his compensation for milling; a charge made by the owners of a fair or exhibition for the privilege of exhibiting or selling goods; a compensation for services, especially for transportation, as canal or railway toll. In the United States tolls, as applied to bridges and highways, are a subject for State legislation, while those applying to rivers and harbors are usually in the province of Congressional action. Tolls were at one time of international importance, since they were exacted on certain straits and tidal rivers by virtue of the sovereignty of a particular state, such as the Scheldt tolls and sound dues levied by Denmark. See also TAXATION.

Tol'man, Herbert Cushing, American Greek scholar: b. South Scituate, Mass., 4 Nov. 1865. He was graduated at Yale, and studied at the University of Berlin. He became assistant in Indio-European languages at Yale in 1891; later took the chair of Latin, and afterward of Sanskrit, in the University of Wisconsin. In 1893 he taught Sanskrit and Greek in the University of North Carolina, and since 1894 has been professor of Greek in Vanderbilt University. He has edited Latin and Greek text-books and contributed to various periodicals articles on Oriental, philological and archæological subjects.

Tolman, William Howe, American social economist: b. Pawtucket, R. I., 2 June 1861. He was graduated from Brown University in 1882 and has been general agent of the New York Association for Improving the Condition of the Poor. He has published 'History of Higher Education in Rhode Island' (1891); 'Municipal Reform Movements in the United States' (1894); 'Handbook of Sociological Reference for New York City' (1894); etc.

Tolowa, tōl'ō-wä, originally the name of a village, but extended to designate a tribe of the Athapascan stock of North American Indians occupying the coast of California from a point a few miles north of the mouth of Klamath River northward to a short distance beyond the boundary of Oregon, and the valley of Smith River. They are noted basketmakers and subsist largely on salmon and other fish, acorns, and other natural products. In 1862 they were placed on a reservation, which was abandoned six years later, since which time they have lived on their own resources. They are now but a remnant of a once comparatively populous tribe, and are greatly demoralized.

Tol'stoi, COUNT Lyof Nikolaievitch, Russian novelist, religious teacher, and social reformer: b. Yasnaya Polyana, government of Tula, 9 Sept. 1828. In 1843–6 he studied Oriental languages and law at the University of Kazan. In 1851 he went to the Caucasus district as an ensign of artillery, and he served in the defense of Sebastopol during the Crimean war. To this period of his career belong his earliest literary works, among them the autobiographical 'Childhood, Boyhood, and Youth,' the brilliant descrip-

tions of the Crimean campaign entitled 'Sebastopol in December 1854,' 'Sebastopol in May 1855,' and 'Sebastopol in August 1855,' and 'The Invasion.' He left the army on the conclusion of the war and went to Saint Petersburg, where he made the acquaintance of Turgenev (q.v.) and other distinguished Russians, and soon after he published 'The Snowstorm' and 'Two Hussars.' His first foreign journey was made in 1857, and marks an epoch in his spiritual history, and on his return he retired to his estate to live a simpler life. He was greatly interested in the condition of the peasantry, and founded a free village school on his property, for which he prepared reading and other text-books himself. His 'Family Happiness' was issued in 1859, and was soon followed by 'Three Deaths' (1859), 'Polikuschka' (1860), and others. In 1862 he married the daughter of a Moscow physician. The next period of his life saw the production of the two works upon which his literary reputation chiefly rests, 'War and Peace' (1865–8), dealing with Napoleon's invasion of Russia; and 'Anna Karenina' (1877), a powerfully realistic study of human passion and its effects. Soon after the completion of the latter novel Tolstoi began to develop his characteristic views of religion and its application to individual and social life. He believes that the Sermon on the Mount literally interpreted is the supreme law of the Christian life, and he lays special stress on the precept, "Resist not evil." His system has much in common with the anarchist-communism of his fellow-countryman Kropotkin, but its peculiar religious basis gives it a unique character. In 1901 he was formally excommunicated by the Holy Synod of the Russian Orthodox Church, and in a reply to the edict of excommunication he clearly enunciated his religious and theological views. These include the denial of the Trinity, of the deity of Jesus and his vicarious atonement, of orthodox conceptions of the future world, of every kind of sacramentalism, and similar dogmas, and are substantially identical with those of modern spiritual Unitarianism. Among the works of his latest period, in which his religious and social views are more or less expounded, are the following: 'What the People Live By' (Eng. 1889); 'What to Do' (Eng. 1889); 'My Confession'; 'My Religion'; 'The Death of Ivan Ilyitch' (1886); 'Where Love is there God is Also'; 'The Kingdom of God is Within You'; 'The Kreutzer Sonata' (1890); 'Work While ye have the Light' (Eng. 1890), a tale of the early Christians; 'The Power of Darkness,' a drama; 'The Fruits of Enlightenment' (1891), a satirical comedy; 'Master and Servant'; 'Politics and Religion'; 'Patriotism and Christianity' (1894), on the Franco-Russian alliance; and 'What is Art?' (1898). 'Resurrection' (1900) is a powerful novel of the same type as 'Anna Karenina.' There are American translations by Dole, Hapgood and others. Tolstoi has given up all privileges of rank in order to live a life of labor and asceticism, and during the great Russian famine he found abundant opportunity for carrying out his gospel of social service. Consult: Turner, 'Count Tolstoi as Novelist and Thinker' (1888); De Vogüé, 'Le Roman Russe' (1888); Löwenfeld, 'Leo Tolstoi' (1892).

Toltecs, tŏl'tĕks or tōl-tāks', an Indian tribe said to have occupied portions of the Mexican plateau previous to the advent of the Aztecs. Little is known of the race and that little only through Aztec traditions and picture writing. They are supposed to have come from the north and to have been supreme in their territory from the 7th to the 11th century. Their principal city was Tolan, where they settled about 661 A.D. from which they get the name Toltec. Lists of their kings or chiefs are extant — but these are considered untrustworthy by antiquaries. The hero-god Quetzalcohuatl is supposed to have lived in their cities before their overthrow, which came in 1013, when they were driven south by savage tribes. Aztec records tell no more of the Toltecs, but from the fact that the Quichés and other tribes from the north are known to have settled in Guatemala about this time, the inference that they were portions of the banished Toltecs is strong. But the accounts of the Toltecs are so vague, all in all, that some historians doubt their existence, while others assert that until their overthrow they ruled over a powerful empire covering a great part of the plateau. But conservative writers accept a median view, recognizing that some of the Mexican monuments are of greater antiquity than the Aztec period and holding that the Aztecs were in large measure indebted to their predecessors for their civilization, religion, and arts. If the Aztec picture-records of the Toltecs are true, the latter race present striking analogies to the Etruscans, and are analogous in a less degree to the Egyptians. They were great builders, and their religion, intimately connected with the study of astronomy, was an intricate system of myths and traditions, and was interpreted by a large and intelligent priesthood, who formed an exclusive caste. A picturesque but unconfirmed account of the Toltecs is given by Prescott in his 'History of the Conquest of Mexico' (Book I.).

Tolu Balsam, a balsam that exudes from incisions in the bark of a leguminous tree of South America, the *Toluifera Balsamum.* It is a soft sticky body when fresh, but becomes hard through age. Of a yellowish brown color and having a very agreeable aromatic odor and taste. Used in various medicinal preparations particularly in cough medicines.

Toluca, tō-loo'kä, Mexico, the capital of the state of Mexico, situated 32 miles southwest of the national capital. It stands on the plateau at the foot of the extinct and snow-capped volcano, Nevado de Toluca, 15,000 feet high. The city has a pleasant climate, is regularly built, and contains several handsome buildings. There are a brewery, cotton-mill, and several other manufacturing industries, and export trade in hams and sausages. Pop. (1900) 25,904.

Tolu'ric Acid. Toluyl-glycocoll, $C_7H_7CONHCH_2COOH$, an acid homologous with hippuric acid and formed in the urine of dogs that have been fed with toluic acid. Colorless, odorless, soluble, prismatic crystals.

Tom, known as **Blind Tom,** Afro-American musician: b. near Columbus, Ga., 25 May 1849. He was the son of slave parents and blind from his birth. When only four years of age he attracted the attention of his master by a remarkable reproduction upon the piano of music rendered in his hearing, and later astonished

the world by his extraordinary performances upon that instrument. He first appeared as a public performer in New York in 1861, and for many years thereafter played in the principal cities of the United States and Europe, where his unparalleled gifts became widely known.

Tom, Asia, a river in Siberia, in the government of Tomsk, rising in the Abakanic Mountains, and after a course of 450 miles flowing into the Obi, near Tomsk, on its right bank. It begins to be navigable at Kusnezk.

Tom Brown's School Days, a story depicting English public-school life, written by Thomas Hughes, and published in 1857, when the author was a young barrister of three-and-thirty. It leaped at once into a deserved popularity it has never lost. Tom is a typical middle-class lad, with the distinctive British virtues of pluck, honesty, and the love of fair play.

Tom Jones, a novel by Henry Fielding, published in 1749, when the author was 42. He had, however, been long at work upon it and the book represents the zenith of his literary power. 'The History of Tom Jones, a Foundling,' is the full title of the book; Tom is the foundling, left on the doorstep of a charitable gentleman, Mr. Allworthy, who gives him a home and rears him with care. Tom's many experiences are narrated with great liveliness, reality, and unction, the reader being carried along irresistibly by the author's high good spirits. No other 18th century story gives such truthful, varied and animated scenes of contemporaneous life in country and town.

Tom, Mount, in Hampshire County, Mass., near Mount Holyoke, and overlooking the Connecticut Valley. It is between the cities of Holyoke and Northampton. Thousands of tourists ascend Mount Tom each year on account of the grand view from its summit.

Tom Thumb. See STRATTON, CHARLES SHERWOOD.

Tom-tom, or **Tam-tam**, a native East Indian drum used by musicians, jugglers, public criers, etc. It is generally cylindrical in form, the depth of body being about three times the diameter of the heads, of which there are two. It is made of resonant wood or of hard-baked earthenware, and the heads are covered with skins, drawn tight by side-lacings, as in the modern drum. It is beaten with the fingers or the open hand and produces a hollow monotonous sound. Similar instruments used by the natives of Western Africa receive the name of tom-tom, as do also certain types of Chinese gongs.

Tom'ahawk, a weapon of warfare of North American Indians, a light war axe. Before the advent of the white traders the head of the axe was usually a piece of stone sharpened at both ends and put through a piece of wood, in the form of a pickaxe; sometimes the stone was shorter and more like a modern double-axe; sometimes hard horn was sharpened and used in the place of the stone. But the white traders brought the natives iron hatchet heads and the stone ones were gradually discarded. These hatchets had but one cutting edge, the other shorter end being formed into a hammer-head, or oftener into the bowl of a pipe, which communicated with a tubular hollow made in the handle, thus made to serve as a pipe stem. From the custom of the Indians of burying their tomahawks when they made peace with a foe comes the custom of saying that two opponents who have made peace have "buried the hatchet."

Tomales, tō-mä'lĕs, a bay on the coast of California, about 35 miles north of San Francisco. It is a narrow inlet of the Pacific, the railroad is near and parallel to its eastern shore, and Tomales Point is on the west, separating the bay from the ocean.

Toman', or **Tomaun'**, a current gold coin of Persia worth 7*s.* 2½*d.* or about $1.76. The value of the toman is not very constant, since it varies in different localities and according to the government's necessities. At times it assumes a value of about $2.25 or even higher. In Persia it is reckoned as the equivalent of 100 schakis or shakis.

Tomato, a perennial herb (*Lycopersicum esculentum*) of the order *Solanaceæ*. It is a native of western South America, whence it was introduced into cultivation in Europe during the 16th century. At first the wrinkled fruits were regarded with suspicion or disfavor, and were more popular as garden ornaments than for other purposes. During the 18th century both yellow and red-fruited sorts were known, but not until the middle of the 19th century was there a decided improvement in the form of the fruit. At the beginning of that century the fruits were used to a small extent for pickles and preserves, but less for other purposes. The development of the tomato both in its form and its popularity as a vegetable is mainly due to the care of plant-breeders, who have eliminated the wrinkles from the fruit, and to the development of perfect methods of canning. The annual consumption of tomatoes, both as a salad and cooked or preserved in various ways, aggregates thousands of tons in the United States, where the crop is more widely grown than in any other country of the world. The season opens in midwinter in Florida and the Mississippi delta, and advances northward until September, when it ends in Canada. Considerable quantities of tomatoes are forced in greenhouses at various seasons, but especially during the spring months.

Though perennial in its native country and in other frostless climates, the tomato is best known in the temperate regions as an annual herb. It is a straggling, clammy, ill-smelling, grayish-green plant with variously formed pinnate leaves and small racemes of small yellowish flowers, followed by fleshy many-seeded berries which in some improved horticultural varieties weigh more than a pound. Several botanical varieties have been recognized, among which the following are best known: Cherry tomato (*L. esculentum*, var. *cerasiforme*), grown in gardens for its little yellow or red globular fruits which are used for home-made preserves and pickles; pear and plum tomato (var. *pyriforme*), similar to preceding except in form of fruit; large-leaf tomato (var. *grandifolium*), a group of varieties originated during the closing quarter of the 19th century, and including some of the most important commercial varieties; the common tomato (var. *vulgare*), the most widely cultivated form in America. One other species is cultivated, more for ornament than for its fruit, which, although edible, is too small for general household use; it is the currant tomato

(*L. pimpinellifolium*), also known as the German raisin tomato. The plant is very spreading and branchy, with small egg-shaped leaves and long racemes often bearing more than 30 currant-like red fruits. It has produced hybrids with the preceding species, and is useful for covering unsightly objects during the summer. The former species has been grafted upon its close relative, the potato, but the two plants have never been known to cross-fertilize. These grafts are interesting as curiosities but not otherwise.

Several other plants have been called tomato; the best known are probably the husk tomato (*Physalis pubescens*), also known as the strawberry tomato, ground cherry, and dwarf cape gooseberry. It is popular in gardens for its fruits which are made into preserves or kept in their husks in cool dry rooms until needed for use in mid-winter. The name strawberry tomato is also given to *Physalis alkekengi*, better known by its specific name and as the winter cherry or bladder cherry. The red fruits are edible, but are not generally relished. The plant is chiefly ornamental on account of its very showy blood-red calyces. The tree tomato (*Cyphomandra betacea*) is cultivated to a small extent for its light brown, egg-shaped fruits, which resemble the tomato in flavor but are rather more musky and acid.

In cool climates the seeds are generally sown under glass in early spring and pricked out in flats, boxes, or pots when the first pair of true leaves appear, allowing them to stand in the former not closer than 3 x 3 inches or 2 x 6 inches. Abundant ventilation should be given at all times and the temperature kept rather low to make the plants grow stocky and able to adapt themselves readily and without check to the conditions of the field. At this time they should be about five inches tall. The sturdier the plant, the less is it likely to suffer under ordinary conditions and care when set in the field, the earlier will it commence to bear, and the more profitable will be the fruit.

Whenever possible the tomato should be planted on rather rich loamy soil of medium texture and well exposed to the sun. Good drainage is essential. It is generally considered best to apply stable manure to previous crops, because the applications made during the current year are thought to impair the flavor of the fruits as well as to induce a rampant growth of vine at the expense of productivity. In the field the plants are usually set 4 to 5 feet apart each way, and when grown extensively each sixth or eighth plant in the row is omitted and each 15th or 20th row is skipped, so as to facilitate harvesting with least injury to the vines, wagons being driven across the field to distribute the empty crates and collect the full ones. Until the vines spread and thus prevent tillage, cultivation is given weekly to keep the surface lose and free from weeds. Often a top dressing of some readily soluble fertilizer is given after the plants have been in the field about a month.

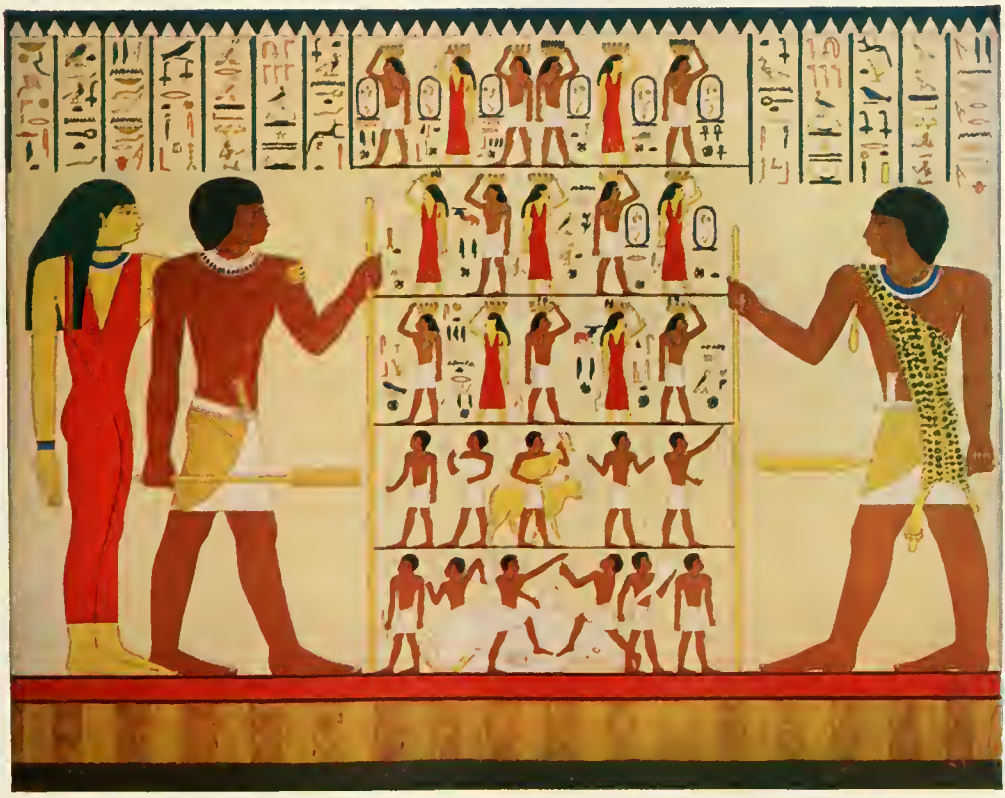
For home use and for fancy markets tomatoes are often trained in many ways, especially to stakes, upon slat frames, and trellises. For such the plants are subjected to more or less pruning and tying, which usually vary with individual growers. But the single stem is usually conceded to be the best method of growing such plants. The advantages secured by training are early ripening, and better colored, larger sized and superior flavored fruits.

Since the vines are tender to frost the tomato season is usually cut short before mid-autumn. There are, however, at that time many fruits approximately mature, besides large quantities less advanced. The former may be gathered and ripened in warm rooms or sunny windows, and by storing in cool places from which they can be removed to warmth as needed the season may be extended several weeks after the vines have been destroyed. The greener fruits are widely used for making sweet pickles, chowder, and "India relish."

In greenhouses the tomato is one of the most popular vegetable crops. Though it is often grown in special houses or as the leading crop it is probably more frequently employed as a successor to carnations and some other greenhouse plants, which either commence to fail in the early spring months or have a smaller sale when brought into competition with spring flowers. The fruits are sought about Easter time and from then until the out-door plants commence to bear the greenhouses may often be very profitably employed. Hand pollination is generally considered essential to the setting of the fruit and the labor this involves is often a drawback on account of its expense. The plants are raised usually from seed, sometimes from cuttings, or the rooted tips of plants which previously occupied the benches. They are planted in soil similar to that in favorable fields, either in solid beds, on shallow benches or in boxes or pots, the second being generally preferred. The plants are usually trained to a single stem supported either by a stout cord suspended from the sash-bars or upon a trellis, the former preferred. Two feet apart is the favorite distance; five feet the preferred height, and a minimum temperature of 60 degrees the lowest night temperature. Sixty-five degrees is preferred by most growers. Abundant light and air must be given at all times, but water must be carefully controlled, especially in cloudy weather, because the plants are apt to grow too rapidly to foliage if water is in excessive supply. During the winter months an average crop of three pounds of fruit to each plant trained to a single stem is considered fairly good. In the spring months four pounds is perhaps below the average. Unless 30 cents a pound can be realized during the winter the crop is rarely paying, and many growers set the profitable figure at 40 cents a pound. In the spring a somewhat lower price with a rather higher average production makes the crop profitable.

The more progressive tomato growers are alive to the fact that the so-called plant diseases which have been reported injurious to the tomato are more readily prevented by intelligent management of the plants than by the use of so-called remedies. Every effort is therefore made to keep the conditions in the seed bed as well as in the field as favorable as possible. Adequate ventilation, rather low temperature and limited water supply are found conducive to the health of the seedlings. And sturdiness at the time of setting in the field is a safeguard against subsequent troubles. Growers whose methods produce inferior plants, or who are negligent in various other respects, often suffer serious losses;

INTERIOR OF TOMB OF PRINCE MERAB. (Part 1)



INTERIOR OF TOMB OF PRINCE MERAB. (Part 2)

and perhaps the majority still have recourse to fungicides, none of which have been found fully satisfactory and in some instances have failed completely from the first trial.

Many insects feed upon the tomato, but very few are usually numerous enough to do serious damage. The best known are probably the boll-worm (*Heliothis armigera*), the tobacco-worm (*Phlegethontius carolinus*) and various species of cutworms. Flea-beetles, potato-beetles and thrips are also well known enemies. As a rule, however, they are not responsible for serious damage. The larger species are generally picked off by hand and the smaller are driven away to other plants by the use of repellants such as tobacco dust, Bordeaux mixture, etc. See FUNGICIDE AND INSECTICIDE.

Consult: Bailey, 'Cyclopedia of American Horticulture' (New York 1900–02); and numerous bulletins of the agricultural experiment stations and of the United States Department of Agriculture.

M. G. KAINS,
Crop Expert.

Tomb, a term applied alike to an excavation or chamber to receive the dead body of a human being and to the monument erected to his memory, and most used to denote the one structure that answers both of these purposes. Among Eastern peoples it early became the practice to place the remains of the dead in excavated chambers or in case the dead bodies were first burnt, to place urns containing the ashes in such chambers. These structures even in times of great antiquity were decorated within or without with appropriate inscriptions. Early tombs often bore character writing, telling of the parentage and the place of residence, perhaps the station of life, of the deceased, and, in the case of heroes, the history of achievement was in all likelihood carved on the walls of the structure. Rude peoples whose only means of written expression was by picture-writing have employed that language to tell of the exploits of the persons buried in their tombs. Tombs are often designed to contain the remains of more than one person, and of such were the Roman columbarium and the Egyptian pyramids. With some races tombs were made elaborate objects of art; with others, such as the Greeks, they were highly artistic but simple and tasteful. The stele or flat stone set up to mark a grave was often highly carved, and the stele of Dexileos in Athens is famous. Large edifices built as monuments to the dead are not found in Greece, but were common in the semi-Greek lands of Asia, the most noted being that of King Mausolus of Caria, whence comes the term mausoleum (q.v.). Roman monuments were of great splendor, as is attested by the few examples remaining to the present time. They were often of large proportions, the so-called "Castle of Saint Angelo" being nothing else than the tomb of the Emperor Hadrian and his successors, "stripped of its sculptures, its marble colonnade, its probably conical superstructure," and crowded with defensive works that make of it a veritable citadel. Other tombs of great splendor are found outside of the walls of Rome and although despoiled and in some instances subverted to the purposes of other, adjacent architectures, they testify to the wealth and the artistic attention which the Romans bestowed on them. Pompeii, too, had its long street of magnificent tombs, which has been partially uncovered outside the limits of the city proper. In portions of Italy and in some of the older Spanish-American towns burials in the cemeteries were made in niches which rose row above row, terrace-like. In the niches rested coffins bearing the bodies. Burial in churches was prohibited during the earlier centuries of Christianity, but from the custom of erecting churches or chapels over the graves of martyrs the custom arose to bury monarchs under the cover of the church, and the most important tombs of the Middle Ages are generally so situated. The earlier examples consist of a simple stone coffin or sarcophagus, often with a low, gabled lid and a sculptured cross. Following these come the altar-tombs, in the form of a table, and subsequently, in the 13th century, a species of tomb consisting of a sarcophagus bearing a recumbent figure of the deceased, the whole surmounted by a canopy, often of exquisite beauty of design. Still more stable are the church-yard tombs of which fine examples are seen in the tombs of La Scala in the church-yard of Santa Maria Antica in Verona. The tombs of the Renaissance period became more and more complex. The sarcophagus was disguised and subordinated to the decorations of sculptured upholstery and groups of symbolical or mythological figures. Immediately following the Middle Ages the beauty and value of the statuary employed partly compensated for the loss of architectural design, as is the case in Michelangelo's tombs; but in succeeding years this redeeming feature was lost and tomb architecture rapidly declined to the vitiated state in which it has remained until modern times. Consult the pamphlet by Jean Baptiste Christyn, 'Les tombeaux des hommes illustrés,' etc. (1674); and the paper by L. S. Mercier, 'Le tombe di Verona' in 'Teatro italiano moderno' (Vol. II., 1792).

Tom'bac, an alloy consisting of from about 75 to 85 parts copper, mixed with 15 to 25 parts zinc, and used as an imitation of gold for cheap jewelry. When arsenic is added it forms white tombac.

Tombigbee, tŏm-bĭg'bĭ, a river in Mississippi, which has its rise in Tishomingo County, and flows south and southeast to Lowndes County where it enters Pickens County in Alabama. It continues an irregular southern course and unites with the Alabama River 45 miles north of Mobile Bay. From the point of junction the waters enter Mobile Bay by Mobile (q.v.) and Tensas (q.v.) rivers. The total length is 455 miles. It is navigable for 412 miles from Mobile Bay, to Aberdeen, Miss.

Tombs, The, a noted city prison in New York. It occupies the entire block bounded by Center, Elm, Leonard, and Franklin streets, and is connected with the criminal courts building on the other side of Franklin street by an upper story closed passage, locally known as the "bridge of sighs." The old Tombs building has been partly torn down to make way for a newer structure on the Center street side. But the old portion still standing will indicate something of the fine Egyptian architecture in which the original structure was built. Its proportions are grand in their beauty, but they are dwarfed into insignificance by its situation and by the high commercial buildings surrounding it. The prison covers the site of the pre-Revolutionary gibbet and therefore stands on ground long dedicated

to penal punishment. Its internal arrangement is into corridors of cells which rise in tiers one above the other. The sanitary arrangements are almost perfect, and it is generally remarked that persons confined in the prison awaiting trial, and only such persons are confined in The Tombs, usually gain in health rather than lose by their imprisonment.

Tomcod, or Frost-fish, a species of small cod (*Microgadus tomcod*) of the North Atlantic, usually abundant in the mouths of the rivers after the first frosts of autumn. It is from 4 to 12 inches long, olive-green above, and silvery below. It is a good food-fish, and has several useful relatives on the Pacific coast.

Tome, Jacob, American philanthropist: b. York County, Pa., 13 Aug. 1810; d. Port Deposit, Md., 16 March 1898. In 1833 he settled in Port Deposit, and there acquired a fortune in business. In 1864 he entered political life as State senator, being chairman of the Senate Finance Committee, and was instrumental in reducing the indebtedness of the State greatly to the public welfare. His public benefactions include a large gift to Dickinson College, and the establishment of a technical school, the Jacob Tome Institute, at Port Deposit, which he erected at a cost of $1,600,000, and by his will permanently endowed with an equal sum.

Tomé, tō'ma. See CONCEPCIÓN, CHILE.

Tom'linson, Everett Titsworth, American author: b. Shiloh, N. J., 23 May 1859. He studied at Williams College, and afterward taught in various preparatory schools in the Eastern and Middle States, but in 1894 began to devote himself to literature, particularly to the writing of historical books for children. His publications include: 'The Boy Soldiers of 1812' (1895); 'Three Young Continentals' (1896); 'Tecumseh's Young Braves' (1897); 'Washington's Young Aide' (1898); 'A Jersey Boy in the Revolution' (1899); and 'Under Colonial Colors' (1902).

Tommy Atkins, a popular nickname given to the private soldiers of the British army. The name is said to have originated in the custom of making out blanks for military accounts with the name, "I, Tommy Atkins," etc. Kipling has immortalized it in verse.

Tomp'kins, Charles H., American soldier: b. Fort Monroe, Va., 12 Sept. 1830; d. Washington, D. C., 1895. He studied at West Point, but resigned without completing his course. In 1856, however, he enlisted in the dragoons, and was promoted 1st lieutenant in the 2d United States Cavalry in 1861. At the outbreak of the Civil War he was assigned to service in the defense of the National capital and was engaged in one of the first reconnoitering expeditions. He was particularly distinguished for bravery in the Shenandoah campaign, and was brevetted brigadier-general in 1865. After the war he served as chief quartermaster in various divisions of the army, and in September 1894 was retired with the rank of colonel.

Tompkins, Daniel D., American statesman: b. Westchester County, N. Y., 21 June 1774; d. Staten Island 11 June 1825. He was graduated at Columbia College in 1795, and afterward admitted to the bar, but soon entered political life. He was a member of the New York legislature and of the State Constitutional Convention in 1801 and in 1804 was elected to Congress, but was appointed to the State supreme bench, and accepted that position instead of going to Washington. He was governor of New York in 1807–17 and in 1817–25 was Vice-President of the United States. He took an active part in the War of 1812, and was one of the strongest and most able opponents of slavery. It was largely through his influence that the bill abolishing slavery in New York was kept before the legislature, but he did not live to see its enactment.

Tomp'son, Benjamin, American poet: b. Braintree, Mass., 14 July 1642; d. Roxbury, Mass., 13 April 1714. He was graduated from Harvard and was long a teacher at Cambridge. He wrote 'New England's Crisis,' a long poem of King Philip's war.

Tom's River, N. J., village, county-seat of Ocean County; on the Pennsylvania and the Central of New Jersey R.R.'s; about 50 miles east of Philadelphia, 36 miles southeast of Trenton, and four miles from Barnegat Bay. It is one of the colonial villages of New Jersey; and in the Revolutionary days it was a haven for privateers. The salt found here made it a place of importance in the settlement days. On 24 March 1782 the village was burned by the British. It is now a favorite summer resort. The chief industries are connected with the care of summer guests; but there are considerable shipments of cranberries, farm products, fish, and oysters. It contains five churches, four schools, and one bank. Pop. (1890) 1,147. No separate returns for 1900.

Tomsk, Asia, in western Siberia, (1) capital of the government of its own name, on the Tom (q.v.). It is the seat of a governor and of a bishop and of the educational district of West Siberia. It has 20 Russian churches, monastery, convent, synagogue, mosque, university with three faculties, technological institute, theological seminary, and various other schools for both sexes; also various scientific societies, Russian musical society, theatre, library, halting station for deported Russians, banks, harbor, etc. The industrial works comprise tanneries, distilleries, wagon factories, etc. There is a brisk transit trade with Siberia. It lies on a branch of the Siberian railroad. Tomsk dates from 1604. Pop. (1897) 52,430. (2) The government has an area of about 330,000 square miles and is in the south and southeast mountainous, and embraces the Altai system. The Ob and its tributaries are the chief streams. There are vast swamps in the flat districts. The climate is very cold and unhealthful. Storms and earthquakes occur often. Pop. (1897) 1,917,527.

Ton, a measure of weight and capacity, equivalent to 20 hundred-weight. As the hundred-weight of Great Britain and the United States contains 112 pounds, the ton is reckoned as 2,240 pounds. This is known as a "long" ton. In some of the States legislation has made the ton consist of 2,000 pounds, being 20 cwt. of 100 pounds each. This is known as a "short" ton. United States laws make the ton equal to 2,240 pounds when not otherwise specified. As a measure of capacity, of a vessel or a car, a ton is 40 cubic feet; this is an "actual" ton. The "register" ton contains 100 cubic feet. See TONNAGE.

Applied to liquid measure the word, in the form tun, was in common use with the old English wine dealers. A tun of beer contained 216 gallons, of 282 cubic inches each, while a ton of wine contained 252 gals. of 231 cubic inches each.

Tonal'ity, in music, the character and quality of tone. Good tonality demands: correctness of pitch, the production of sounds slightly out of tune being termed of doubtful tonality; correctness of intonation; and correctness of key relation, a passage wanting in definiteness of key or scale being termed of uncertain tonality. The word has been adopted by art critics and is applied to painting in considering the system of tones, or the color-scheme, of a picture.

Tonawanda, tŏn-a-wŏn'da, N. Y., village in Erie County; on the Niagara River, Tonawanda Creek, and Erie Canal, and on the New York, Central & Hudson River railroad; opposite North Tonawanda and 10 miles north of Buffalo. Several railroads pass through the village on leased roads, and electric lines connect the village with Buffalo and Niagara Falls. It is in a fertile agricultural region, and on account of the good water power, extensive manufacturing interests have been developed. The chief manufactures are lumber and lumber products. The government census of 1900 gives the number of manufacturing establishments, 60; the amount of invested capital, $1,540,789; the number of employers, 398; the amount paid for material annually, $1,227,349; and the value of the products, $1,676,280. The educational institutions are a high school, public and parish schools, and a public library. The two banks have a combined capital of $300,000. Pop. (1890) 7,145; (1900) 7,421.

Tondo, tōn-dō', Philippines, a district of the city of Manila, the most northern district on the bay shore. The streets are mostly narrow, the houses built of cane and nipa; it contains a large church and convent, the station of the Manila & Dagupan Railroad, and the city slaughterhouse. The inhabitants are mostly fishermen and laborers engaged in the tobacco and cigar industries.

Tone, Theobald Wolfe, leader of the United Irishmen: b. Dublin 20 June 1763; d. there 19 Nov. 1798. He was graduated at Trinity College, Dublin, in 1786; practised law for a time without much success; and gradually politics became his absorbing interest. He held republican opinions, and believed that Ireland ought to assert her rights as an independent nation; but the objects of the clubs of United Irishmen started at Belfast and Dublin in 1791 were limited to legislative reform. In 1792 he was appointed secretary of the general Catholic committee. The government came to know through a spy that he had given information in 1794 on the question of invasion to an emissary of the French government, but they permitted him to leave the country and go to America. He sailed from New York to France in 1796, and urged the French government to undertake an invasion of Ireland. He was adjutant-general in Hoche's abortive expedition against Ireland in 1797, and he afterward served under Hoche on land. He accompanied one of the small French expeditions sent to assist the Irish rebels in 1798, but was taken prisoner after a brief naval engagement near Lough Swilly. He was tried by court-martial at Dublin, convicted of treason, and ordered to be executed within 48 hours. He, however, cut his throat in prison. Consult: The edition of his journals and political works, with a 'Life,' by his son (1826), of which a new edition, entitled 'The Autobiography of Wolfe Tone,' was issued by Barry O'Brien (1893).

Tone, any sound considered with reference to its pitch, timbre, and volume. In music, tone signifies the musical vibration of a sonorous body. Nearly all tones in music are composite, consisting of several simple constituents having different rates of vibration and known as partial tones. They vibrate according to fixed laws, the pitch depending on the nature of the sonorous body and the mode of producing its vibration. The partial tone having the lowest pitch (and usually the loudest sound) is called the prime or fundamental tone, while the other partial tones are called accessories, harmonics, or overtones. Tones differ in quality or timbre according to the number and relative force of their partial tones. In written music the sign by which a tone is represented is a note (q.v.).

To'ner, Joseph Meredith, American physician: b. Pittsburg, Pa., 30 April 1825; d. Washington, D. C., 1 Aug. 1896. He was graduated at the Jefferson Medical College in 1853, and established himself as a medical practitioner in Washington in 1855. He was the originator of the plan for the American Medical Association Library established in Washington in 1868 and made a part of the Smithsonian Institution, founded the Providence Hospital and Saint Ann's Infant Asylum in Washington, and in 1871 the Toner lectures under the auspices of the Smithsonian Institution. He devised the system of symbols for the indication of geographical localities which was adopted by the Post-office Department, and made valuable researches into early American medical literature. His collection of 26,000 medical books and 18,000 pamphlets he presented to Congress in 1882. His publications include: 'Maternal Instinct, or Love' (1864); 'Medical Register of the United States' (1874); 'Annals of Medical Progress and Medical Education in the United States' (1874); 'Medical Men of the Revolution' (1876); etc.

Tonga, tŏng'ga, or **Friendly Islands**, Polynesia, a group of islands under British protection, situated in the south Pacific Ocean, between lat. 18° 30′ and 19° 30′ S., and between lon. 174° and 175° W., southeast of the Fiji Islands, and southwest of Samoa. The group consists of about 200 islets with a total area of 385 square miles. The largest, Tongatabu, is 20 miles long. The islands are partly volcanic and mountainous, partly of low coral formation. The soil is fertile, and the vegetation luxuriant. The chief exports are copra, fruits, and sponges. The inhabitants belong to the finest of the Polynesian types. They are peaceful, civilized, and Christian. Excellent schools and a college have been established by missionaries. The immediate ruler is the king and native council, whose capital is Nukualofa on

Tongatabu. The islands were discovered by Tasman in 1643. In 1845 they were united under one king. In 1899 they were declared under British protection. Pop. (1900) 18,959, including 659 foreigners.

Tongas, tŏng'gaz, a tribe of the Kaluschan stock of North American Indians, residing around Cape Fox and at the mouth of Portland Canal, southeastern Alaska. They number about 250.

Tongres, tôngr, Belgium, a town in the province of Limburg, on the Geer, 12 miles southeast of Maestricht. The church of Notre Dame (1240) is the first dedicated to the Virgin in the north. The cloister belongs to the 10th century. The industrial works include tanneries, distilleries, and hat manufactories. Pop. (1897) 9,152.

Tongue, the principal organ of the sense of taste and an essential part of the apparatus of speech. The name tongue is also given to various structures in invertebrates. In man the tongue is attached by its base or root to the hyoid bone and to the epiglottis. Its tip, sides, upper surface, and part of its under surface are free. Its under surface is fixed to the lower jaw by the genio-hyoglossi muscles, and from its sides the mucous membrane is reflected on the inner surface of the gums. In front of the under surface a fold of the mucous membrane is specially developed, and is named the frenum linguæ. The upper surface is convex, and bears a deep middle line, the raphé, which ends behind in front of a deep follicle or sac — the foramen cœcum. The front two thirds of the organ are rough, and bear the characteristic structures known as papillæ, in which the sense of taste resides. The posterior third is smooth, and exhibits the openings of numerous mucous glands. The substance of the tongue consists of numerous intrinsic muscles, which are named superior and inferior longitudinal and transverse muscles. The mucous membrane consists of an upper layer or cutis supporting papillæ, and covered with epithelium. This cutis supports the blood-vessels and nerves, and into it the muscles of the tongue are inserted. The papillæ, which cause the characteristic roughness of the tongue, are of three kinds. The circumvallate papillæ number from 8 to 10. They are of large size, and are placed on the hinder part of the upper surface, and extend from the raphé in two diverging lines. Each of these papillæ consists of a rounded central and flattened disk, situated in a cup-shaped depression or fossa. The exposed part of the papilla is itself covered with numerous smaller papillæ. The fungiform papillæ are more numerous than the circumvallate, and are scattered irregularly over the upper surface of the tongue, but are most plentiful on its apex and sides. They are of large size, of rounded, projecting form, and of a deep red color. The filiform papillæ are situated over the front two thirds of the tongue. They are of very small size, and are arranged in rows corresponding with the rows of the circumvallate papillæ. In structure the papillæ are like those of the skin (q.v.), and contain loops of capillary vessels as well as nervous filaments. The mode of termination of the nerves in the papillæ is hardly determined. Numerous follicles and mucous or lingual glands exist on the tongue, the functions of these latter being the secretion of mucus (q.v.). The epithelium (q.v.) of the tongue is of the flat or scaly kind, resembling that of the epidermis or outer skin, but the deeper cells of the epithelial layer do not contain any pigmentary or coloring matter. The muscular halves or substance of the tongue are divided in the median line by a fibrous septum. The arteries are derived chiefly from the lingual and facial trunks and the nervous supply is distributed in the form of three main nerves to each half of the organ. The gustatory branch of the fifth nerve supplies the papillæ in front and those of the sides. The lingual branch of the glossopharyngeal nerve supplies the mucous membrane at the sides and base, and also the circumvallate papillæ, while the hypoglossal nerve is distributed to the muscular substance of the organ.

The gustatory nerves and glossopharyngeal branches are the nerves which provide the tongue with common sensation and also with the sense of taste, the hypoglossal nerve being that which invests the muscles of the tongue with the necessary stimulus. The conditions which appear to be essential for the exercise of this sense are: (1) the solution of the matters to be tasted — that is, their presence in a form in which their particles may readily come in contact with the nerves of taste, there being thus a strong analogy between the sense of taste and that of touch, since the latter sense must be in a manner exercised before the taste of any substance can be perceived; (2) the presence of a specialized gustatory nerve, a necessary condition for the exercise of this sense. Occasionally it happens, however, that other stimuli than those produced by the actual contact of sapid substances with the nerves of taste may excite that sense. If a current of cool air be directed on the tongue a saline taste is perceived; and a smart tap on the tongue will produce a taste analogous to that excited by electricity. It appears necessary that the surface of the tongue itself should be moist, in order that the gustatory sense may be exercised, and hence the inability to taste substances when the palate and fauces are dry and parched. The tongue itself does not appear to be the exclusive seat of this sense. The soft palate, uvula, tonsils, and upper part of the pharynx, in all probability exercise this sense, although in a minor degree when compared with the tongue. The middle of the tongue appears to be most feebly endowed with the sense of taste, the most sensitive region of the organ being the tip and edges. The tongue may occasionally lose its sense of taste and retain its sensibility to touch, or *vice versa.* Variations in taste somewhat unaccountable occur. While some substances taste alike when touched by every part of the tongue, other substances taste differently when applied to different parts of the tongue. Sensations of taste, or at any rate of the impressions of taste, may remain for long periods after the substances tasted

have disappeared, while the frequent repetition of the same taste dulls the sense. This sense may also be excited by internal stimuli as well as by those of external kind.

In the articulation of words, the modulation of sounds, the tongue plays an important part among the organs of speech; and in mastication, swallowing, and nearly all the actions performed by the mouth the tongue is more or less concerned.

Tongue-fish, an English name, corrupted from the French *tangue*, applied to young soles and other small edible flatfish found along the shores of the English Channel. The term has been applied by Jordan to the American genus *Symphurus* of sole-like fishes, occurring on both coasts.

Tongue-tie, an abnormal attachment or adhesion of some part of the tongue to some portion of the surrounding structures of the mouth. The ordinary form of tongue-tie consists in an abnormal development of the frenum. The tongue, in consequence, cannot be extended beyond the lips, and suction and mastication, as well as speech, are impeded.

Tongues, Confusion of, the punishment inflicted on the builders of Babel when God so confounded their language that they could not understand each other, though up to that time there had been among them only one language. The result was that the building of the tower was abandoned, and those who had been engaged in its erection were dispersed over various lands (Gen. xi. 1–9).

Tongues, Gift of, a gift bestowed in connection with the Pentecostal descent of the Holy Sprit. According to the Acts of the Apostles, when the members of the Church had assembled with one accord on the Jewish day of Pentecost, suddenly a mighty, rushing wind entering pervaded the building in which they had assembled, cloven tongues as of fire descended on each, and those on whom they were bestowed began to speak with "other tongues, as the Spirit gave them utterance" — the Parthians, Medes, Elamites, and others, who repaired to the place when news of the miracle reached them, bearing testimony to its reality (Acts ii. 1–21).

Tonic Sol-fa. See SOL-FA, TONIC SOL-FA, or MOVABLE DOH SYSTEM.

Tonics, remedies which promote nutrition and thus increase the strength or tone of the body, when it is reduced. They restore the functional activity of various tissues, and not merely increase the vigor of muscular fibres, as was formerly believed. Tonics are of two kinds, medicinal and non-medicinal. The medicinal tonics are variously classified, according to the part of the body they principally act upon, or to the effects they produce. Those that increase the secretions of the alimentary canal, the saliva, gastric, or intestinal juice, etc., and so aid digestion, are spoken of as gastric or stomachic, intestinal and digestive tonics. Examples of such tonics are the vegetable bitters, cinchona and its derivatives, quassia, columbo, gentian, taraxacum, nux vomica, and the salts of strychnine; dilute mineral acids, small doses of alcoholics, and extracts of malt. Valuable adjuncts to the above are vegetable and animal pepsin. Blood or hæmatic tonics are those which improve the quality of the blood, and include iron and its salts, arsenic, manganese, mercuric chloride, and quinine. Vascular tonics which increase the tone of the blood-vessels include belladonna, digitalis, ergot, and strychnine. General tonics act chiefly as nutrients, gradually increasing the weight of the body, or exerting a stimulating or modifying action upon the tissues. Cod-liver oil and other fats, salts of phosphorus, and arsenic act as general tonics. Nerve-tonics, or nervines, which increase the tone of the nervous system, include arsenic, strychnine, salts of iron, zinc, copper, and silver, phosphorus, ammonium chloride, and quinine; cardiac tonics, digitalis, strophanthus, strychnine, strengthen the heart's action. The non-medicinal tonics (usually classed as general tonics) are sunlight, friction, electricity, and massage; also exercise in the open air, and cold in its various forms and applications, as air, the shower and sponge bath and sea-bathing.

Tonics are employed in conditions of debility of the body generally, or of its different parts, but unless properly used they do harm. For example, bitter tonics should not be used when there is severe pain and tenderness of the epigastrium, a heavily coated tongue, and vomiting of blood or much mucus. While iron is an efficient remedy in most forms of anæmia, it is generally futile in chronic wasting diseases and in organic affections. Tonics should be given in small doses and should not be continued for too long a time without intermission.

Tonika, tŏn'ę-kạ, a tribe of North American Indians, forming a distinct linguistic stock, and formerly residing on the Lower Yazoo in Mississippi. They were allies of the French colonists in their contests with neighboring tribes and in 1699 were reported to occupy 260 cabins extending over four leagues. In 1706 they were driven away by the Chickasaws and Alabamas, and in 1730 were defeated by the Natchez, who burned their village and killed a number of them. The remainder retired to the lower Mississippi, where, in 1760, they occupied three villages, and in 1802 numbered about 400 souls. The Tonikas were an agricultural tribe; the women made pottery and a fabric from the mulberry. Polygamy was not common. There are now about 25 survivors of the tribe, near Marksville, Louisiana, who speak their native language as well as Creole and English.

Tonk, India, a small native state of the Rajputana, east of Ajmer-Merwara. Area, 1,114 square miles; pop. (1901) 143,330. The capital, Tonk, has a pop. of 38,641.

Tonka, tŏn'kä, Lower Siam. See PUKET.

Tonka, Tonqua, or Tonquin, Bean, is the fragrant seed of the leguminous tree *Dipteryx odorata*, native to the northern countries of South America. The tree grows to 80 feet in height, and bears fruits which are pod-like, oblong, and fibrous, and contain a single seed. This is of the shape of an almond, but larger, in a shining black coat. Tonka beans have the

fragrance of new-mown hay, due to the same odorous principle, prismatic coumarin, as the sweet vernal grass and melilot. They are used for their aroma, either whole or powdered, for scenting clothes, snuff, and in perfumery, and even as a substitute for vanilla.

Tonkawa, tŏng'ka-wä, a nomadic tribe of North American Indians, comprising a distinct linguistic stock. They formerly roamed over the plains of Texas, were noted for their cannibalistic practices, and were regarded as outlaws by the surrounding tribes. Early in the 19th century they were reported to number between 2,000 and 3,000, but in 1857, when they were settled on a reservation on the Upper Brazos River, in Texas, their number was officially estimated at fewer than 1,000. During the Civil War (5 Jan. 1862), owing to their refusal to join the Comanches, Delawares, and others in an insurrection against the whites, the latter Indians attacked a party of some 200 Tonkawas, comprising more than half the tribe, killing all of them. The remainder returned to Texas where they stayed until 1884, when they were placed on a reservation in Oklahoma. Here the 54 survivors now live with the Poncas.

Tonkin, tŏn-kēn', or **Tongking'**, French Indo-China, a territory under French protection, bounded on the north by China, on the east by the Gulf of Tonkin, on the south by Anam, and on the west by Laos. Area, 46,400 square miles. It consists of a mountainous region surrounding on three sides the large alluvial plain and delta region of the Sonk-koi. The latter flows through the centre of the territory from northwest to southeast, and opens a navigable waterway into the interior of southern China. The principal mineral resources are deposits of coal, iron, copper, and gold. The climate is hot and humid, and the alluvial plain of Tonkin produces some of the best rice in the world. Sugar, cotton, tea, Indian corn, and opium are also cultivated to a great extent, and on the higher ground there are coffee plantations. The manufactures include silk, paper, cotton textiles, indigo, and oils. Commerce has rapidly increased, the exports, chiefly rice and animal products, amounting to over $5,000,000 annually. The principal port is Hai-fong, which has steamship connection with Hongkong, Yokohama, and Cochin-China. Railroads run from Hanoi to Hai-fong and Nam-dinh, and nearly to the Chinese frontier. Hanoi is the capital, and, since 1902, also the capital of the whole of French Indo-China. Tonkin was an independent state until 1802, when it became a province of Anam. The latter is still its nominal position, although the Anamite vice-royalty was superseded in 1897 by a French residency, and the French protectorate is more direct here than in Anam proper. Pop. estimated at 7,000,000, with 33,000 Chinese, and 6,900 Europeans.

Tonkin, Gulf of, Indo-China, an arm of the China Sea extending northward between French Indo-China and the Chinese island of Hainan. It is about 400 miles long and 200 miles wide.

Tonnage, the weight of goods carried in a boat or ship expressed in tons (q.v.); also the carrying capacity of a ship expressed in cubic tons. In ascertaining the carrying capacity of a ship under the old style of measurement the depth of the vessel was assumed to be the same as its breadth and the tonnage was obtained by multiplying the length by the breadth by the depth and dividing the product by 94, the quotient being the tons burden. But this rule was found to be impracticable since shipbuilders sought to evade tonnage and harbor dues by building their ships very narrow and deep. In 1835 the British Parliament remedied these defects by new measurement laws, which, as amended by the Merchant Shipping Acts of 1854 and 1894, are in force to-day. Under this system, known as that of Moorsom, actual measurements of the depth of the vessel are made at certain intervals, the number of which depends on the length of the tonnage deck, and at these points transverse areas are computed. These transverse areas after being multiplied by certain numbers are added together, multiplied by one third the common distance between the areas, and then divided by 100. To the quotient must be added the tonnage of deck-houses, poop, and all spaces above the tonnage deck — which is obtained by multiplying the horizontal area by the mean height, and dividing by 100 as before. The sum of these two, in cubic feet, gives the gross register tonnage, each ton containing 100 cubic feet. The British system of measurement was adopted by the United States in 1864, and subsequently, with slight variations, by all maritime nations. In freighting vessels 40 cubic feet of merchandise are generally taken as a ton. The duty of tonnage is charged on the size of vessels; it is a survival of the old British "tunnage and poundage" formerly charged on ship's cargo, and especially on wines.

Tonom'eter, in music, an instrument for measuring the pitch of tones, such as a tuning fork or a set of graduated tuning forks. The best known tonometer was invented by Scheibler in 1834, and was subsequently improved by König. It consisted of an exceptionally perfect set of tuning forks with an apparatus for determining the exact number of vibrations per second produced by a given tone. In medicine, tonometer is an instrument for measuring the tension of the eyeball during certain diseases.

Tonquin. See TONKIN.

Tonsils and Tonsilitis. See NOSE AND THROAT.

Ton'son, Jacob, English publisher: b. London 1656; d. there 2 April 1736. In 1678 he opened his shop at the Judge's Head, Chancery Lane, near Fleet Street. He soon became the publisher of Dryden's works, and continued as such for many years. In 1690 he completed the purchase of the publishing rights of 'Paradise Lost,' and afterward claimed that he made more on that poem than on any other. About 1700 he removed his shop to a place in Gray's Inn Gate. When the Kit-Cat Club (q.v.) was founded he was made its secretary. He purchased a house at Barn Elms and provided a room there for the meetings of the club. In 1710 he moved to the Shakespeare's Head. Here he continued until his retirement from

business in 1720. His name is associated with nearly all the literary men of his time: with Pope, whose pastorals appeared in Tonson's 'Miscellany' (1709); with Addison, for whom he published 'Cato' (1713) and for a time issued 'The Spectator'; with Congreve, Steele, Waller, etc. Wycherley spoke of him as having long acted as gentleman-usher to the Muses. He published Rowe's edition of Shakespeare (1709).

Ton'sure, the bare place on the heads of Roman Catholic and Greek priests, formed by shaving or cutting away the hair and keeping it so. The custom of cutting away the hair in token of the dedication of a person to the service of God is very ancient, being mentioned as early as the 4th century. The tonsure furnishes a means to distinguish the higher clergy from the lower, as the extent of the tonsure increases with the rank. Many religious orders (for example, the Franciscans) allow only a narrow strip of hair around the head to grow: all above and below is shaved. Shaving the hair precedes consecration: it is performed by the bishop.

Tontine, tŏn-tēn', the name applied to a financial system in which gain accrues from survivorship. The word is derived from the name of Lorenzo Tonti, a Neapolitan who settled in Paris in the time of Cardinal Mazarin and who invented this style of life annuity. Tonti proposed the system to the French government as a method of raising money and while the plan was not adopted, still it served as a model on which all future tontines were operated. The members of Tonti's association were to subscribe the sum of money needed by the government and were to receive life shares in the society. There were to be 10 classes of subscribers, according to their age, and for each class a fixed sum was to be divided yearly among the members of the class. When a member died his share was divided with the rest among the members of the class so that the death of each member benefited all those remaining, and the profit to the last few survivors in each class was enormous, while the sole survivor received the entire sum of interest accruing to his class. Upon his death the interest ceased and the borrower obtained the capital. In 1689–92 the system was used by Louis XIV., who was sorely in need of funds. He organized a tontine with a capital of $70,000,000, which lasted for a period of 40 years. The sole survivor drew an annual income of $367,500 from his original investment of $1,500. During the following century the tontine was frequently used in France and in Great Britain, and in at least one instance in the United States, in order to raise large sums of money, but in the last named country they were never other than private enterprises. A disastrous private tontine in France, known as the "Caisse Lafarge," was established in 1791. When 60,000,000 francs had been subscribed into the company it was found that either through gross error or fraud the interest promised was an impossible one and the subscribers owing to the financial panic then prevailing lost not only their interest but their capital as well. The last public tontine was opened in England in 1789 and the interest, amounting to $210,150, was paid as late as 70 years after that date. The Irish tontines, established 1773–7, drew as many as 3,500 members. Tontines in the United States were at one time popular as a means for raising money for the erection of large buildings. The New York Tontine Society, founded in 1790, was wound up 1870–8, while tontine buildings were erected in New York, New Haven, Albany, and other American cities.

Although tontines in their old form were long ago abandoned by financiers, the tontine system as applied to life assurance has given rise to an important modification of the usual insurance policies. What is known as the tontine dividend policy has the following distinctive features: The holders of such policies constitute a class by themselves; they do not participate in profits until after the lapse of the tontine period, usually 10, 15, or 20 years; the representatives of the insured in case of his death before the commencement of the dividend period, receive only the sum mentioned as the face value of the policy; no surrender value is allowed to anyone who relinquishes his policy before the dividend period and all profits from whatever source are reserved until that period, when the accumulated dividends are to be equitably divided among the holders of such policies as are then in force. Modifications from these general principles are practised by the various societies. For further information consult F. De Peyster's 'History of the Tontine Building' (1855), with which is usually published 'The Constitution and By-Laws of the Tontine Association, New York City.'

Ton'to (Spanish, "foolish"), an inappropriate name applied by the Spanish colonists of Arizona in the 19th century to a number of Indian tribes, namely: (1) To the Tulkepaia, a tribe of the Yuman stock settled in 1875 on San Carlos reservation, Arizona. (2) To the Eoyotero Apaches, an Athapascan tribe. (3) To the Pinal Apaches of the same stock. (4) To a mixture of Yavakai (Yuman) men and Pinal women who have intermarried. The name has been especially applied to the last mentioned body, who formerly occupied Tonto Basin and the Pinal Mountains of central Arizona, whence some 500 of them were removed to the Rio Verde reservation and later to the San Carlos reservation. They number about 700, and speak a mixed Yuman-Athapascan language.

Tonty, tŏn'tē, or Tonti, Henri de, Italian explorer: b. about 1650; d. Fort Louis (Mobile) September 1704. He was a son of Lorenzo Tonti. He entered the French army, served also in the navy, and in 1678 came with La Salle (q.v.) to Canada, went with him into the Illinois country in 1680, undertaking the first civilized occupation of that region, and was placed in charge of Fort Crèvecœur, a little below Peoria, where La Salle left him. In 1681 he joined La Salle at Michillemackinac, and with him descended the Mississippi to its mouth. Subsequently he was in command at the stronghold on "Starved Rock," called by La Salle Fort Saint Louis, and in 1688, after La Salle's death, unsuccessfully at-

tempted the rescue of the French colonists left in Texas. "There are very few names in French-American history," says Parkman, "mentioned with such unanimity of praise as that of Henri de Tonty." He wore a metal hand with which he so effectively disciplined the Indians on occasion that they thought him a great medicine man. Consult: French, 'Historical Collections of Louisiana,' Vol. I. (1846); Parkman, 'The Discovery of the Great West' (1869; new ed. 1898).

Tooke, John Horne, English politician and philologist: b. Westminster 25 June 1736; d. Wimbledon 18 March 1812. He was educated at Westminster and at Eton, whence he was removed to Saint John's College, Cambridge. In 1756 he entered himself of the Inner Temple, but in 1760 he took orders. He was a warm opponent of the American war, and was prosecuted for sedition for the wording of a resolution by which the Constitutional Society voted £100 to the widows and children of the Americans "murdered by the king's troops" in the battle of Lexington. For this obnoxious paragraph he was tried at Guildhall in 1777, and sentenced to a year's imprisonment and a fine of £200. In 1780 he published a keen review of Lord North's administration, in a pamphlet entitled 'Facts,' and in 1782 a 'Letter on Parliamentary Reform.' In 1786 he published in an octavo volume his work entitled 'Epea Pteroenta' (Greek for 'Winged Words'), or the 'Diversions of Purley.' In 1801 he accepted the seat for Old Sarum. His political life closed with the dissolution of Parliament in 1802. Tooke possessed considerable learning. His 'Epea Pteroenta' is original and ingenious, and has exercised considerable influence on the subsequent development of philological investigation.

Tool-stones, a name given by antiquaries to prehistoric stones that have been found in many places in tumuli, cairns, burial mounds, etc. They are described by Sir John Lubbock in 'Prehistoric Times' (see p. 102, etc.) as oval or egg-shaped and more or less indented on one or both surfaces. Their use, he says, is not thoroughly understood, but it is supposed by some antiquaries that they were held between the thumb and finger and used as hammers or chippers. In the larger stones, however, the depressions vary greatly in depth and in some specimens completely perforate the stone, which fact lends color to the theory that tool-stones were used as hammer-heads or as ring-stones for nets.

Toole, John Lawrence, English commedian: b. London 12 March 1833. He was educated at the City of London School. After serving for some time as a wine-merchant's clerk he took to the stage, and made his first appearance at the Haymarket in 1852. He then played with great success in Dublin, Belfast, Edinburgh, and Glasgow, and ultimately became a popular favorite in every town of note in the United Kingdom. In 1880 he began the management of the Folly Theatre, London, which he afterward reconstructed and named after himself. In 1874 he visited America, in 1888 he published his 'Reminiscences,' and in 1890 made a successful tour in Australia and New Zealand. He was one of the most popular actors on the stage, inimitable in his personation of semi-pathetic, semi-ludicrous characters. Among his most successful parts are Paul Pry, Caleb Plummer in the 'Cricket on the Hearth,' and Uncle Dick in 'Uncle Dick's Darling.' One of his latest parts was that of Walker in Barrie's 'Walker, London.'

Toole, Joseph Kemp, American politician: b. Savannah, Mo., 12 May 1851. He removed to Montana, became established as a lawyer in 1870, and served two terms as district-attorney. He was a member of the Territorial legislature in 1879, and of Congress of 1884–8. He was elected to the constitutional convention in 1889, and became the first governor of the newly erected State, serving until 1893. He was again elected governor in 1900.

Tools. The almost innumerable variety of mechanical appliances and devices which are included under the general term "tools" may be primarily classified into three important groups according to the nature of the material worked upon. (1) Wood-working tools; (2) Metal-working tools; and (3) Masonry-work tools; each of which include special forms of hand tools and machine tools which may be still further subdivided according to the class of work accomplished with their aid, or according to the character of the machines in connection with which they are employed.

WOOD-WORKING TOOLS.

The small tools used in wood-working are those mainly employed in carpentry work and consist of the various forms of "guiding" tools, "holding" tools, "rasping" tools, "edge" tools, or "cutting" tools, "boring" tools, "striking" tools, and "chopping" tools.

The machine tools include the various forms of lathes, borers, shapers, and slotters, equipped with suitable accessory devices such as cutters, drills, etc., according to the purposes for which they are used in turning, boring, drilling, and other kinds of work in wood. These appliances and machines are operated either by hand and foot power or by engine developed power. The former in the execution of the lighter classes of work, and the latter where the work is either large in quantity or entails the handling of bulky material.

The Guiding Tools comprise the following named devices:

Chalk-line.— This consists of several yards of light cord wound upon a wooden reel. The cord is well rubbed in with chalk or with charcoal, and is used for the purpose of making marks where cuts have to be made.

Rule.— This is a thin, flat, narrow strip of hard wood, ivory, or metal, usually two feet in length, and graduated or divided on both sides by a series of lines at right angles to the edge of the strip, into inches and fractions of an inch, such as halves, quarters, eighths, twelfths, sixteenths, and thirty-seconds.

Straight-edge.— This consists of a long, flat strip of hard-wood, or of bright hard-steel. Straight-edges range from 4 to 6 feet in length, and from 2 to 4 inches in width. When they are made of wood, well-seasoned material free from winding is essential, and when made of steel they are often nickel-plated in order to prevent them from rusting. The name of the tool implies the nature of its use.

The Squares or Try-squares.— A square usually consists of a wooden stock or back into which a steel blade is fitted at right angles and secured by screws or rivets. It is used for marking-out work at right angles. Squares vary in size from 3 to 30 inches. Sometimes they are made entirely of plain or of nickel-plated steel and have scales engraved on their edges.

Spirit-level consists of a glass tube partially filled with a quantity of spirit so as to allow of the existence of an air-bubble about half an inch in length within the tube. This tube is enclosed in a framework of hard-wood the edges of which are perfectly level and true, and parallel to the axis of the tube. It is protected on the most important sides, the edges, by metallic facings, and is provided with a sight-hole either on the top or at the side through which the movements of the bubble may be observed. Spirit-levels range in length from 8 to 14 inches, and are used for the purpose of ascertaining whether the surface of a piece of work, or the portion of a structure is truly horizontal, or truly perpendicular.

Plumb-level.— This is a cord attached to the exact centre of the upper end of a vertical straight-edge. A weight suspended from the lower end of the cord swings freely in a pear-shaped hole near the lower end of the straight-edge. A straight line is marked on the straight-edge from the centre of the pear-shaped hole to the point of attachment of the cord. In testing the perpendicularity of a surface, one edge of the straight-edge is placed against the surface under test and the coincidence of the cord with the line marked on the straight-edge is carefully noted.

Gauges.— Three kinds of gauges are used in carpentry work — the "marking" gauge, the "cutting" gauge, and the "mortise" gauge. The marking gauge consists of a head or block which slides along a shank or "strig" about nine inches long. A spike is inserted near the end of the shank and the movable head is provided with a screw or a wedge by which it may be fixed at any required distance from the spike. It is used for the purpose of making a mark on a piece of wood parallel to an edge which has been previously straightened, and along which the head of the gauge is guided while the spike inflicts the mark. It is very useful in dressing several pieces of wood to exactly the same breadth. The cutting gauge is similar to the marking gauge in all respects with the exception of the spike which is replaced by a thin steel plate. This plate passes through the shank and is held in place by a set-screw, and is sharpened on one edge so that it is capable of cutting either with or across the grain. It is used for gauging dovetailed work, and for cutting veneers to equal breadths. The mortise gauge is also similar to the other two gauges, but it is provided with two spikes, one fixed and the other movable and capable of being adjusted at different distances from the fixed spike by means of a set-screw. It is used for the purpose of gauging mortise and tenon work. Compound gauges consisting of combinations of cutting and marking gauges, or of marking and mortise gauges are also commonly used for the purposes designated.

Bevels.— These are made somewhat like the squares, but with the exception that the blades are attached to the stock by a pin which permits of their being set at any angle other than a right angle, and are used for the purpose of marking lines at such angles to the first side of the piece of work. In some forms, the blade is slotted through a part of its length and is called a "sliding" bevel. Others such as the "boat-builder's" bevels, have two brass blades one at each end of the stock, while in the "protractor" bevels the sliding arm works through a semicircle graduated into degrees.

Mitre-box.— This is a device for guiding a saw so that it will cut at an angle of 45°. In its simplest form it is a rectangular box composed of two vertical sides fastened to the bottom. A saw-cut made at an angle of 45° through the sides guides the saw when it is employed to cut a piece of wood such as a picture molding placed in the mitre-box. Other cuts than those at an angle of 45° may be made in the same box by cutting the guiding cuts at the required angles through the sides of the box, but the most convenient form of mitre-box for cutting a wide series of angles is one provided with movable guides which may be readily set at the required angles. As a rule, the mitre-edges of the moldings are left rough from the saw so as to make the glue adhere more firmly, but where sawed mitre-work requires to be planed smooth, it is planed up with a "shooting-board" which consists of two pieces of wood screwed together so as to form a step, on the upper one of which two strips of wood are screwed at right angles to each other. These strips act as guide-bars against which the piece of molding to be mitred is held, and then planed off on the edge of the step.

Compasses and Calipers.— These devices are made of metal, and are employed for the purpose of taking dimensions such as the inside and outside diameters of pipes and other cylindrical work that cannot be taken accurately with a rule. A compass consists of two legs which are movable about a sector joint. In the form called a "wing-compass," it is provided with a metal arc and a set-screw attachment which permits of its being set to correspond with a definite measurement, and remain so set without variation, until that particular measurement is no longer required. Compasses are also used for striking-out circular figures.

Calipers are termed "inside" and "outside" calipers according to the character of the dimensions taken by their aid. Inside calipers are made with straight legs which are bent around only at the point and are used for measuring internal diameters. Outside calipers are made with bowed legs and are used for taking measurements of external diameters. "Combination" calipers are an improved form in which the legs are pivoted near the middle point, thus making four movable ends, two of which are bowed and are used for taking outside measurements, and the other two straight and applicable to the taking of inside measurements.

Trammels.— These are appliances in the form of beam-compasses in which the heads slide along a straight bar to which they may be tightened by set-screws. The heads are made either of brass or of boxwood, the former being preferable, and steel points are inserted into the bodies. They are employed for the purpose of taking measurements and for striking arcs which exceed the capacity of the ordinary compasses.

Caliper-rules and the Caliper-squares.— The caliper-rule consists of a short steel rule a portion of which is attached to a closely fitting slide which may be drawn out until the object to be measured is embraced between the opposing portions of the rule. As both the rule and the slide are graduated into minute fractions of an inch, the thicknesses of the objects measured can be read off directly from the dimensions on the slide.

Bell Centre-punch.— This is a useful little device by the aid of which a square, round, oval, or triangular article may be instantaneously and accurately centred for the purposes of drilling and turning. It consists of a punch which is enclosed within a tube the lower end of which is expanded or tapered into the shape of a bell. This tapering mouth adapts itself to bars of different diameters, and when dropped over the end of a bar of any cross section whatever, insures the marking of the exact centre of the bar by the point of the punch.

The Holding Tools are represented by the various forms of pincers, vices, and clamps.

Pincers.— These consist of various forms of implements shaped somewhat like tongs, and are used for the purpose of drawing nails from timber. They are made of iron and faced with steel in the jaws. The faces are made large and nearly flat so as to afford great power of leverage.

Vices.— These are made in a great variety of forms and sizes, the most useful of which are those with parallel movement in the jaws. The ordinary vice consists of a pair of steel-faced jaws one of which is capable of being moved by a screw or by a lever, while the other is fixed rigidly. The improved forms are provided with swivel-bases, and swivel-jaw attachments, which enable them to grip the work in any position that may be required for convenience in working. These appliances are usually attached to the bench and are used for holding or gripping pieces of work which require to be held firmly, but which have not sufficient weight in themselves to remain stationary or immovable under the operation of the tools. The vice-jaws are usualy steel faced. In fitting them to a vice they are first screwed to the wrought iron backing and serrated while untempered, they are then removed and hardened, and subsequently screwed back into place on the backing. In the smaller forms the steel-jaws are usually welded to the backing. In the form commonly known as the "taper" vice, a loose jaw-piece rounded on the back and capable of movement in a corresponding hollow seating, is attached to the fixed jaw. It affords a slewing movement by which the vice may be adapted to different angles for holding various forms of tapered work. The vice-claws or vice-clamps are simply angle strips of lead, brass, or copper, which are placed against the jaws in order to prevent the bruising of delicate pieces of work by the serrations on the hard-steel faces.

Clamps.— These comprise several forms of appliances for holding together pieces of work in position for nailing and screwing, or for tightening up the joints in glued work in order to allow sufficient time for the glue to harden. The ordinary form consists of a long iron bar and two brackets which slide thereon. One of the brackets is capable of being moved freely to any point on the bar while the other is actuated and its amount of travel limited by a screw which is attached to the end of the bar and operated by a lever handle. The bar is provided with a series of holes along its length for receiving the iron bolts by which the freely sliding bracket may be held stationary at any desired point. In this form of clamp the length of opening varies from 3 to 6 feet. Some of the other useful forms are the adjustable "screw-clamp" and the "corner-clamp," the latter being a very useful device for securely gripping two sides of a picture frame while they are being nailed or glued together.

The Rasping Tools comprise the various forms of saws, files and rasps.

The Saws are an important class of tools employed for cutting and dividing substances. In general, the saw may be defined as a tool having a serrated blade and furnished with a handle or frame by means of which it is operated either by hand as in the case of the hand saws, or by belting as in the case of the power driven saws. The saw-blade or saw-plate is usually made of the best tempered steel, and the form, length, and pitch of the teeth are designed and made to suit the class or character of the work performed, and the nature of the material worked. The various terms used for describing the principal parts of a saw may be briefly defined as follows: "Space," the distance between the points of two adjoining teeth. "Pitch" or "Rake," the inclination or angle of the face of a tooth. This varies from 65° to 70° for cutting soft-woods, and from 80° to 85° for cutting hard-woods. The corresponding "relief-angle" or the angle formed by the base and top of the tooth varies from 45° to 50° for soft-woods, and from 65° to 70° for hard-woods "Gullet" or "Throat," the depth of the tooth from the point to the root. "Gauge," the thickness of the saw-blade, usually determined by the wire-gauge. "Set," the amount of lateral inclination given to the teeth to one side or the other of the plane of the blade for effecting a clearance of the sawdust. "Points," the number of teeth points to an inch, taken as a unit in estimating the coarseness or fineness of a saw. The teeth of cross-cut saws are usually formed to cut both ways. Saw teeth are designated by various names such as "peg" teeth, "M" teeth, "half-moon" teeth, "gullet" teeth, etc., according to their peculiar form. The various kinds of saws commonly used by wood-workers are the "hand-saws," the "back-saws," the "frame-saws," and the "pad-saws." The "pit," "deal," "frame," "band," and "circular" saws are mostly used in connection with the production of lumber and sawmill-work. American made saws appear to be much superior to those of foreign make, and are more desirable under almost all conditions.

Files and Rasps.— These comprise a class of tools having surfaces covered with sharp edged furrows or teeth, which are employed for removing particles of wood, metal, or other material by the process of abrasion or the cutting action of a multitude of fine points. They are made in a vast number of shapes and sizes, and of various degrees of fineness or coarseness to adapt them to various kinds of work and materials. A file differs from a rasp in that its furrows or teeth are made by straight cuts in-

flicted on its surface by a chisel or by a sand blast either in a series of single cuts or crossed cuts, while the teeth of a rasp are a number of isolated projections raised on its surface by the pyramidal end of a triangular punch. See FILE AND FILE MAKING in this Encyclopedia.

Edge Tools comprise the various forms of chisels and gouges, the planes, and a miscellaneous assortment of spokeshaves or smoothing tools, and various appliances such as grindstones, emery wheels, and oilstones, used for maintaining a sharp cutting-edge on the various tools.

Chisels and Gouges.— The essential principle of these types of cutting tools is that of the wedge. The chisel in its simplest form practically constitutes the slice of an axe, but as its action or movement is the result of the force applied to it by the blows of a mallet or hammer, the eye of the axe is replaced by a suitable device for receiving the blows. When the element of thrust enters into the operation of a chisel as in the cases where it is used by the simple pressure of the hand, its action passes into that of the plane iron. Chisels are specifically defined as "chipping," "cross-cut," "firmer," "pairing," and "mortice" chisels. The chipping chisel or cold chisel is used by fitters, boilermakers, and metal-workers in general. The firmer chisels are the ordinary short chisels used by wood-workers, and are so designated in order to distinguish them from the paring chisels which are usually about twice the length of the firmer tools, and are almost exclusively used by patternmakers. Paring chisels are seldom driven with the mallet, but are actuated by hand pressure alone. They are made in widths ranging from ¼-inch to 2 inches. The mortise chisel is a stout wood-workers' chisel which is driven with a mallet, and used for cutting mortises where percussion and leverage are rendered necessary. The gouges are forms of paring and firmer chisels which have curved cross-sections. The cutting-edge of the paring gouge is formed by grinding its inner face, and that of the firmer gouge by grinding its outer face. Gouges vary in width from ⅛-inch to 2 inches. The paring gouge differs from the ordinary firmer gouge in its increased length. It is never driven with the mallet, but is applied with a thrusting motion of the hand, and is used chiefly by patternmakers for cutting the various curved outlines of their work. It will be observed, that as a rule, the chisel cannot be satisfactorily used over a surface wider than itself, and therefore the gouge was devised in order to obtain a tool of greater utility for that purpose. In practice this advantage is partially realized, but there still remains quite a tendency on the part of the gouge to follow the grain of the wood instead of cutting through the fibres at a very slight inclination. All gouges are held and used in the same way as a paring chisel, but if any occasion demands the driving of a gouge with a mallet, it should always be held in a perpendicular position.

Spokeshaves or Drawing Knives are essentially two-handed chisels which can only be used by being pulled towards the operator. The general form consists of a long, narrow, chisel-edged blade the ends of which are attached to two handles which stand at right angles to the blade. These handles are of wood, and the "tangs" into which the ends of the blade are prolonged are bent around at right angles to the blade and pass right through the handles, and are riveted over brass plates at their ends, in order to prevent the blade from being drawn out of the handles when it is drawn towards the workman against the resistance of the wood. These tools are used for cutting thick and heavy chips off the rough edges of boards so as to decrease the amount of the work required in the planing operations, and they are also used by patternmakers for the cutting of sweeping curves or "sweeps" in work where great accuracy is not essential. The American toolmakers have introduced several novel types which are provided with cutters of varying forms, and which are effectively used for chamfering, rabbeting, and other similar purposes. These types are usually called "routers."

Planes.— In its simplest form the plane consists of a chisel-shaped plane-iron, placed at an angle in a "stock" or box of wood or metal in such a way that the cutting edge projects slightly through the bottom of the box. It derives its value from the guidance imparted to the cutting edge by the sole or bottom of the box. The plane is operated by being pushed forwards over the surface of the material being worked, so that the cutting edge bites into the fibre and removes a thin shaving which slides upwards along the upper side of the plane-iron and is thus discharged from the hollow of the box. The depth of the cut or the thickness of the shaving removed may be regulated by raising or lowering the plane-iron which is usually held in place by means of a wedge or by a screw, and is therefore capable of being thus adjusted quite readily. The plane-irons are made both single and double. In the latter case, the back-iron is introduced for the purpose of breaking the shaving so as to reduce the amount of cumulative indrawing force due to the continuity of the fibre of a long shaving. Planes in which double plane-irons are used are called "built-up" planes. There are at least a hundred different kinds of planes in use at the present time, but all of them may be grouped into three general classes — the "jack-planes," the "trying-planes," and the "smoothing-planes." The jack-plane is the first plane used for roughing down the timber received from the hands of the sawyer, or from the sawmill. The cutting-edge of its plane-iron is more curved than those of the other planes, and consequently takes coarser and narrower shavings. The trying-plane is used after the jack-plane for producing the greatest accuracy attainable in the surfacing of wood by hand. It is usually about 22 inches in length, and carries a plane-iron 2½ inches in width. The cutting-edge is sharpened perfectly straight transversely, and this, combined with the length of the plane, enables the workman to produce very true surfaces by its use. The smoothing-plane is a small plane used for imparting a smooth finish to surfaces in work where accuracy is not essential. It is made about 8 inches in length, and is designed to carry plane-irons ranging from 1¾ inches to 2¼ inches in width. Some of the more useful and important special forms of planes are the "rabbet" or "rebate" plane, employed for making window frames and other similar work in which a rabbet or recess is required to be cut for the reception of the

edges of a glass plate or other material; the "plough" employed for cutting a deep groove along the edge of a board for the reception of a corresponding tongue formed along the edge of an adjoining board; and the "stop-chamber" plane employed for cutting any chamfer or bevel-edge ranging from ⅛-inch to 1½ inches in size, with a constant angle.

Grindstones, Emery Wheels, and Oil Stones. — The sharpening of the cutting-edges of chisels and plane-irons is performed first on a grindstone or on an emery wheel, and then finished to a fine edge on an oilstone. Grindstones are natural stones which are turned into circular form, and are made of varying diameters. They are usually arranged to revolve in troughs containing water, but they ought not to run actually in the water as that would tend to soften them and cause them to wear unequally. The water should be fed onto them from a drip can. They are revolved by a crank-handle attached to the axle, and make about 100 revolutions per minute when used for grinding ordinary tools. Various forms of rests or supports have been devised for holding the tool during the process of grinding, but in the case of wood-working tools they are seldom used, the workmen usually preferring to hold the tools by hand against the edge of the revolving stone. Grindstones are "trued" or "turned-up" by hand by means of pointed bar of steel which is constantly rotated during the operation so as to always present a new cutting-edge to the stone, and they are "trued" mechanically by means of a threaded roller of steel which is clamped in a frame and allowed to rotate against the surface of the stone. Such appliances are called "grindstone truers." Emery wheels are grindstones made of powdered emery cemented together, or of emery cemented to a wooden centrepiece. The cementing material usually employed is a silicate insoluble in water, and the wheels are usually made in about ten degrees of coarseness. When used for grinding the wheels are revolved at a high rate of speed. Emery itself is a species of corundum composed of oxide of iron, alumina, silica, and a small proportion of lime. The oilstones, sometimes called "hones," are essentially fine grained natural stones which are used for producing the final edge on cutting tools by the process of abrasion, with oil instead of water to assist the process. They are usually set in wooden stocks and provided with covers to protect them from dust and grit. The principal varieties are the Turkey, the Charnley Forest, the Arkansas, the Grecian, and the Washita stones. As a general rule, oilstones will wear away the most in the middle and become hollow both in the direction of their length and breadth. Sometimes, as in the case of the sharpening of jack-plane irons, this hollowing out is somewhat of an advantage as it imparts a desirable curvature to the cutting edge, but when it extends to an inconvenient degree, the surface of the stone is levelled by being rubbed on a flat sandstone or on an emery slab. The best oil for use on oilstones are sperm and neat's foot oil, but olive oil and petroleum are also used. Gouges and head-planes are usually set or sharpened by means of oil-slips or thin slips of oilstone about 6 inches long and 2 inches broad and ranging from ⅛-inch to ½-inch in thickness, the edges of which are rounded in a transverse direction to fit the hollow faces of the tools.

Boring Tools comprise the various forms of awls, gimlets, augers, bits and braces, and the drills.

Awls or Bradawls are the simplest forms of boring tools, and are used for preparing holes for the admission of nails and screws. In its ordinary form the awl consists of a small steel rod one end of which is fastened to a wooden handle and the other end double-bevelled to a sharp V-shaped edge by which the fibres of the wood may be compressed and parted so as to form a hole without producing chips and dust. The greatest drawback in the ordinary forms is the tendency of the steel rod to pull out of the handle when the tool is withdrawn from the hole it has made in the wood. This is especially the case when working in hard-woods. In the superior forms this fault is remedied by the use of a hollow handle which contains a number of awls of different sizes, each of which may be fastened to the handle by means of a screw-nut.

Gimlets are particular forms of awls, and are used for the same purpose. The gimlet in its simplest form consists of a small steel rod one end of which is attached to a wooden handle which forms a T with the rod, and the other end is shaped into the form of a screw. This end consists of a point in the form of a taper screw, and a spiral groove which extends part-way of the stem or body as in the case of the "twist-gimlets," or the body may be hollowed out into a nearly semi-cylindrical shell as in the case of the "shell-gimlets." The commonest forms are called "spikes," while other forms are designated as "triple-twist" gimlets, "auger" gimlets, "patent-twist" gimlets, and "brewers-twist" gimlets, according to the shape of the spiral body. A complete assortment of these tools are usually required by a wood-worker.

Augers are merely large gimlets. They are made in both the twisted and the shell forms, and are operated by both hands by means of a wooden bar thrust through the eye at the handle end of the stem. Their sizes increase ⅛-inch at a time from ⅜-inch to 2 inches in diameter.

Bits and Braces.— The bits comprise the various forms of boring tools such as "centres," "shells," "gouges," "countersinks," etc. They are actuated by the "brace" or "stock." These tools were developed in order to overcome the faults inherent in all forms of awls, gimlets, and augers, due to the interruption of the continuous rotation of those tools necessitated by the changing of the position of the hands, and by the limited amount of pressure applied to the tool. The stock or brace consists of a crank one end of which is provided with a round head for receiving the pressure of the breast of the operator, and the other end recessed for the reception of the bit. In the earlier forms the bit was secured in the receiving end of the brace by means of a thumb-screw which engaged a notch near the end of the stem and constituted the weak point of the compound tool. This defect has been remedied in the later forms by the use of various kinds of expanding devices or expanding-chucks which adapt themselves to all shapes and sizes of stems, and hold the bits securely and truly in place. The centre-bit comprizes the centre-point, nicker, and cutter at-

tached to a shank. The nicker and the cutter are actuated by the brace and revolve about the centre-point. It is used for boring large and deep holes. The countersinks are made in a great variety of forms, and are designated as "snail-horn," "rose-head," and "flat-head" according to the shape of the cutting point. In wood work they are employed for enlarging the entrances of holes when it is desired to let the heads of screws or bolts lie completely below the surface of the wood. They are sometimes called "rose-bits," especially when referred to in connection with metal work. Some of the other useful forms of bits actuated by the brace are the "screw-driver" bit, the shank end of which is square tapered to fit the socket of the brace, and which being revolved with the brace is quicker in its action than that of a hand worked screw-driver; the "taper" bit for boring funnel-shaped holes; the "shell" bit, the cross section of which is composed of a convex and concave curve roughly semicircular in form; the "nose" bit, a shell bit provided with a nose or lip at the cutting-point for the withdrawal of the core from the wood; the "spoon" bit, the cutting-edge of which is formed in the shape of a parabola and therefore does not draw out the core as effectually as the nose bit; and the "gouge" bit, the cross-section of which is similar to that of the gouge and is simply rounded at the cutting-point without the provision of a nose or lip. In the ordinary forms of the compound tool the brace is rotated through complete revolutions, thus preventing the boring of holes or the driving of screws in one side of a corner at a distance any closer to the adjacent side than that which is equal to the radius of revolution, but this shortcoming of the tool is remedied in the ratchet brace in which the brace acts as a lever which moves the bit around and at the same time feeds it forward by means of a ratchet and click actuating a square-threaded feed-screw, as the brace is moved back and forth through partial revolutions.

Drills are boring tools which may be revolved either by some form of hand brace or by a special arrangement of gear-wheels. In form, they are either flat towards the point and simply bevelled and have single or double cutting-edges, or they are of the twist type.

The Striking Tools comprise the various forms of hammers and mallets.

Hammers.— Ordinarily, a hammer consists of two parts — the iron or steel hammer-head, and the shaft or handle of wood which is driven into a hole in the "centre of mass" of the hammer-head. The angles at which the handles are attached to the heads vary greatly on account of the variations in the position of the centre of gravity of the head relatively to the line of the penetration of the handle, and also on account of the various convexities of the faces of the hammer-head. The form of the "pane" or the narrower or smaller end of the hammer-head also varies greatly in the hammers used for different purposes. When of hemispherical form as in the engineers' hammers, it is called a "ball" pane; when it is made in the form of a narrow round-edged ridge placed at right angles to the axis of the handle it is called a "cross" pane; and when the ridge runs longitudinally it is called a "straight" pane. In the claw-hammer the pane is curved upwards towards the handle and is divided by a V-shaped groove, and the head is usually attached to the handle by means of side flanges. It is very useful for drawing nails. The hand hammers used by wood-workers range in weight for ½ ounce to 10 pounds, but hammers weighing from 15 to 56 pounds are commonly used by the metal-workers as hand hammers. The weight of the head and the balance of the head in the handle are the most important considerations controlling the suitability of a particular hammer for use in connection with a particular class of work, and by a particular workman.

Mallets.— These are forms of hammers in which the steel heads are replaced by wooden blocks. They are practically heavy wooden hammers which are used for delivering blows on the handles of chisels and gouges in order to avoid the risk of smashing and splitting them down as is usually the result when iron hammers are used for that purpose. Round-faced wooden mallets are used by molders for rapping patterns with in order to detach the sand which adheres to them when they are drawn from the molds. Mallets of this type are also used by boilermakers for levelling or for bending their plates of iron and steel. Wood-workers' mallets are either square or round in form. The square mallets are about 6 inches in length and 2½ inches by 3½ inches in width. The round mallets are about 5 inches in length and 3 inches in diameter. The mallet-heads are usually made of hickory wood, and sometimes of lignum vitæ. The cost of the latter is about double that of the former.

The chopping tools are the axes, the hatchets, and the adzes. In each case they represent the combination of a striking tool and a cutting tool. In these tools the shape of the handle or helve and the manner in which it is attached to the blade is of the utmost importance in governing their effectiveness.

Axes and Hatchets are too familiarly known to require detailed descriptions thereof; but the conditions which determine their effectiveness and their suitability for various purposes may be briefly considered with profit. These conditions relate to the weight of the blade, to the shape or curvature of the handle, and to the form of the cutting-edge. Axe blades range in weight from 2 to 3 pounds in the smaller types, to 6 and 7 pounds in the larger axes. These blades are usually made by welding the hard tempered steel portion which forms the cutting-edge to the iron portion which contains the "eye" provided for the reception of the handle. The curved form of the handle is designed to counteract the influence of the force of gravity which tends to twist the blade downwards when the axe is used for chopping at varying obliquities. The form of the cutting-edge, curved horizontally, and wedge-shaped transversely to the sides of the blade, is designed for the purpose of separating the groups of wood fibres successively, and for equalizing the pressure of the blow on each side of the blade.

In the adze, the cutting edge stands transversely or at right angles to the handle. The entire outer face of the blade is made slightly curved, and its cutting-edge is formed by bevelling from the inner face. It is usually employed for the forming of lengths of wood into curved shapes.

METAL WORKING TOOLS.

The almost innumerable variety of metal working tools and the great variety of purposes for which they are employed make their classification into a series of general groups practically impossible within a limited space. In a general work they may be conveniently divided into various classes according to the character of the work to which they are applied. Such a method of classification would group the main body of metal-working tools under foundry work, forge shop work, and machine shop work. The last named including all the turning, gear-cutting, and toolmaking tools and appliances. The greater number of these are treated under their special headings in the several volumes of this Encyclopedia, and as in the case of the wood-working appliances, the various kinds of machines employed in the metal-working industries will be found specifically treated under the title METAL-WORKING MACHINERY.

Likewise, the elementary descriptions of the various forms of small tools such as the guiding tools, the holding tools, the rasping tools, the cutting tools, the boring tools, and the striking tools already given in connection with the wood-working tools will be found applicable to similar tools employed in metal working, subject, however, to the modifications demanded by the greater hardness of the material worked, and the greater accuracy of execution required in the finished products of some classes of metal work. In the main these modifications consist in the employment of finer and harder materials in the making of the tools, in the particular forms given to the cutting edges, and in the methods by which the tools are applied in the execution of the work.

The guiding tools employed in metal work are quite similar to those already described, and comprise the various forms of rules, squares, straight-edges, and calipers, all made of metal, and also the various forms of micrometer calipers with vernier attachments which are capable of measuring dimensions as small as 1-10,000th of an inch. These calipers are divided into two general classes — the "yoke" calipers and the "beam" calipers. In the former, the outer end of the shank of the yoke contains a split-nut which is employed for making adjustments for wear. For this purpose, the nut is closed onto the screw by being advanced on the stem towards the yoke. The shell or thimble on which the graduations are marked is attached to the end of the screw and rotates with it, and moves along and over the shank. A speeding arrangement for rapidly advancing the screw is provided in the form of a knurled-nut in the yoke, which is also capable of contracting a bushing over the measuring stem so as to lock it in any desired position. The measuring point and the opposing anvil are carefully ground so as to make their faces perfectly parallel with each other. These micrometers are usually provided with a screw having 40 threads to the inch, with the barrel graduated to tenths and fortieths of an inch. By this arrangement one revolution of the screw advances the thimble one division on the barrel, equal to one fortieth of an inch, and as the circumference of the thimble is divided into 25 equal parts, one twenty-fifth of one revolution of the screw advances the measuring point one twenty-fifth of one fortieth, equal to one one-thousandth of an inch. By the aid of the vernier attachment applied to the barrel measurements as small as one ten-thousandth of an inch are readily obtained.

Gauges and Indicators.— These tools are employed for indicating the sizes of wire, machine screws, drills, and plate thicknesses. Various systems of gauges are employed, in all of which the dimensions are purely arbitrary. The American or Brown and Sharp gauge was adopted to produce a gauge to overcome the irregularities in spacing of the Birmingham gauge. In this gauge the dimensions increase by regular geometrical progression, the largest dimension No. 0000 being equal to 0.46-inch, and the next smaller dimension No. 000 being obtained by multiplying 0.46 by the constant .890522, each smaller number being the product of the preceding number and the constant. Gauges for indicating the gauge of wire or plates are of two forms — the angular and the notch gauges Other forms of gauges are the "centre" gauge which is used for gauging lathe and machine centres in turning and grinding work; the "screw-thread" gauge used for grinding threading tools; the "screw-pitch" gauge used for determining the pitch of screw threads; the "depth-gauge" used for measuring the depth of holes and recesses; the "scratch" gauge used for ruling lines parallel with the edge of a piece of work, and several forms of "surface" gauges which are principally used in determining the parallelism of the surface of a piece of work with the machine table, housing or other plane of reference. They are also used in testing, erecting, and in the setting-up work on machine tools.

Test Indicators are a class of tools or instruments used for determining small irregularities in the truth of cylindrical surfaces, and small variations from the true rotation of such surfaces. They are also used in determining the inaccuracies of a plane surface, and in measuring small amounts of end or lateral motion such as the end motion of a spindle. They are of two types — those which merely indicate the existence of the irregularities, and those which give a reading or measurement showing the exact amount of the errors.

Some of the other small tools indispensable to the metal worker may be briefly summarized as follows:

The various forms of "hack-saws" used for severing purposes. They are operated either by hand or by some form of engine developed power. Their blades are usually made with fourteen teeth to the inch for general work, and with twenty-five teeth to the inch for cutting tubing and thin metal.

The "monkey-wrench" and other forms of wrenches used for screwing and unscrewing the nuts of screw bolts, etc.

The various forms of "drills," and especially the modern "twist-drill" which is universally used at the present time and which has completely supplanted the old flat forged drill which for many years held the first position as a tool for producing circular holes in metal.

The "reamers" and "broaches," which comprise a class of fluted tools used for finishing and truing cored or drilled holes. They are solid when used in a socket or with a wrench,

and shell or hollow when bored out to fit a mandrel.

The "screw-threads," "taps," and "dies," which, according to their use, may be divided into two classes — those used for fastenings, and those used for communicating motion. There are three forms of screw threads used for fastenings — the "V" thread in which the sides make an angle of 60° with each other, and in which the top and the root are sharp; the "United States Standard" thread which is similar to the V thread with the exception that the top is cut off and the bottom filled in; and the "Whitworth" or "English Standard" thread in which the top is rounded off and the root filleted in, and in which the sides form an angle of 55° with each other. There are also three forms of screw-threads employed for communicating motion — the "square" thread, the "trapezoidal" thread, and "Powell's" thread.

The tap is used for producing internal threads, and the die is employed for cutting external threads. They are of two kinds — those operated by hand, and those operated by power driven machines. Hand taps are made in sets each of which comprise three taps — the "taper-tap," the "plug-tap," and the "bottoming tap." The taper-tap is parallel on the point for a distance equal to one-fourth the diameter of the tap, and this point is made the diameter of the roots of the teeth and corresponds to the correct size of the hole to be tapped so as to produce a full thread. In the plug-tap the first three teeth are tapered off, and in the bottoming-tap the teeth extend full to the point. The taper-tap is used for starting a thread, the plug-tap for extending it nearly to the bottom, and the bottoming-tap for finishing the full thread to the very bottom of the hole.

The dies may be divided into two general classes — those which have to be passed over the work several times in order to produce a finished thread, and those by which a finished thread is produced at a single cutting. In the former, the cutting-dies are held in a stock, and are capable of being separated so as to permit of their being passed over the work and then closed, by means of a set screw, an amount sufficient to enable them to cut a full thread. In the latter, when they are not of the screw-plate type, the "chasers" or "cutters" are held radially in a cast-iron "collet" surrounded by a wrought-iron ring. These dies are capable of being adjusted to compensate for wear. The bevelled outer ends of the chasers fit into corresponding bevelled grooves in the wrought-iron ring so that when the ring is forced down the chasers are moved towards the centre. A great variety of self-opening and adjustable dies are also used for machine threading.

MASONRY WORK TOOLS.

The Masonry Work Tools may be conveniently divided into two general classes — stonemasons' tools, and bricklayers' tools. Those employed by either of the two classes of workmen are neither numerous nor intricate in design. The principal tools of the stonemason are the saw, the mallet, the scrabbling hammer, and the various forms of chisels designated as the "inch-tool," the "boaster," and the "broad-tool," which are distinguished by their size, the first being 1 inch, the second 2 inches, and the third 3½ inches in width. In the work of stone cutting, the preliminary operations are performed by a small chisel called the "point," and the finishing work executed by the use of the others in turn according to their size. The principal tools of the bricklayer are the various forms of trowels, the plumb levels, and the bricklayers' hammers. All of them are comparatively familiar to everyone and therefore do not require detailed descriptions, but for further information relative to the various forms of stone cutting saws, see SAWS AND SAWING.

Consult also the articles under the titles FILE AND FILE MAKING; METAL-WORKING MACHINERY; and WOOD-WORKING MACHINERY in this Encyclopedia.

WILLIAM MOREY, JR., C. E.,
Consulting Civil and Mechanical Engineer.
New York City.

Toombs, Robert, American lawyer and statesman: b. Wilkes County, Ga., 2 July 1810; d. Washington, Ga., 15 Dec. 1885. He was the son of a Georgia planter, attended for one year Franklin College (now the University of Georgia), and was graduated at Union College, Schnectady, N. Y., in 1828. In 1829 he studied law at the University of Virginia, and in 1830, being under age, was admitted to the bar by special act of the legislature. Within ten years he became one of the foremost lawyers of Georgia. In 1836, when the Creek war broke out in Alabama, he raised a company of volunteers and served as captain under General Winfield Scott. In 1837–40 and 1842–3 Toombs was a member of the legislature, and during this time became a leader of the State Rights Whigs of Georgia. From 1844 to 1852 he served as representative in Congress, and was one of its best orators and debaters. In 1850 he was a prominent supporter of the compromise measures in the house. In 1852, with other Southern Whigs he refused to support Scott for President. After 1852, like Stephens, he acted with the Democrats. From 1853 to 1861 he was in the United States Senate. In 1854 he favored the Kansas-Nebraska Bill as carrying out the principles of the compromise of 1850. Immediately before the elections of 1860 Toombs lectured in the North on slavery. After the election of Lincoln he advised secession of the Southern States, and made secession speeches in Georgia in December 1860, and in the United States Senate in January 1861, maintaining that in secession lay the only hope of security for the South. Georgia seceded 19 Jan. 1861, and Toombs withdrew from the Senate four days later. In March he was formally expelled. He was chosen to the Confederate Provisional Congress that met in Montgomery 4 Feb. 1861, and by a considerable minority was considered as a candidate for President. On 21 February he was made secretary of state by President Davis. He opposed the firing on Sumter that began the contest of arms. Resigning September 1861 to become a brigadier-general in the Confederate army, he fought with distinction in the second battle of Manassas (Bull Run) and at Sharpsburg (Antietam). He resigned his commission in 1863, and in 1864 was made commander of the Georgia militia. He disapproved the policy of the Richmond administration, and personally disliked

Davis. With Vice-President Stephens and Governor Brown he headed the Peace Movement in Georgia in 1864, thereby doing much to weaken the cause of the Confederacy. In 1865, to escape arrest, Toombs went abroad, visiting Cuba, France, and England. Returning in 1867, he soon amassed a fortune of $500,000 in the practice of law. In 1872 he was a member of the Georgia Democratic convention, and supported Horace Greeley for the presidency. In 1874 the Georgia legislature passed a law providing that railroads should be taxed like other property. The railroads resisted, and Toombs, taking the case of the State, won the suit in the courts and collected all back taxes. For ten years he continued the struggle to force the railroads to pay taxes and give proper service to the public, and in 1877 secured the passage of a law providing for a board of railroad commissioners. Other Southern States have since passed laws modeled after the Georgia law.

By his enemies Toombs was considered extreme and intolerant — a "fire-eater." His friends thought him a statesman of the first order, and were disappointed that he made no higher mark. His hasty temper hindered his career in politics. In the army he was an able general, but not a disciplined subordinate. He belonged to the school of Jefferson in politics, believing in strict construction, State sovereignty, and strong local government, with much liberty for the individual. His political theories were meant for times of peace, but could not stand the strain of war; consequently he was at variance with the Confederate administration from the beginning. As long as he lived Toombs never ceased to denounce the Reconstruction measures of Congress. His experiences from 1865 to the end of Reconstruction caused him so to dislike the United States government that he refused to ask for a pardon or to take the oath of allegiance, and he never again had the privileges of citizenship. Consult: Stovall, 'Robert Toombs, Statesman, Speaker, Soldier, Sage' (1892); Trent, 'Southern Statesmen of the Old Régime' (1897).

W. L. Fleming,
West Virginia University.

Toon, or Toona, a tree (*Cedrela toona*) of the *Cedrelaceæ* or *Meliaceæ*. It is a native of India and Australia, being found at altitudes of 4,000 feet on the Himalaya Mountains as well as near tide level. In the former country it is one of the largest trees; in the latter, it often exceeds 150 feet in height and 18 feet in circumference. Hooker mentions a specimen in India 10 feet in diameter at five feet from the ground. The tree is cultivated for its timber, bark, and flowers. The wood is soft, open-grained, easily seasoned and worked, little liable to warp, and readily polished. The heartwood is reddish and resembles mahogany, and veneers taken from the roots or where branches join the trunk are said to be remarkably handsome. The chief uses of the wood are in house-building, furniture making, carving, etc. Under the names bastard cedar, bastard white cedar, and Moulmein cedar the wood is an important export to English markets. The bark is very astringent and is used for making leather which usually is purplish from a dye also present. The flowers yield a reddish or yellowish dye which is in common use in India. A close relative of this tree, *C. sinensis,* is grown in the United States in streets and upon lawns. It resembles the ailanthus in hardiness and its graceful, feathery foliage, but is superior in regularity, denseness of growth, and in the absence of disagreeable odor during the blossoming period. Several other species are cultivated in California and the Gulf States, but are not hardy in the colder parts of the country. See Mahogany.

Tooth-billed Pigeon, a large fruit-pigeon (*Didunculus strigirostris*) of Samoa, formerly called "dodlet" under the erroneous impression that it was a surviving relative of the dodo. It is about 14 inches long, body rounded, beak orange, with the lower mandible deeply cleft into three distinct teeth near the tip. Head, neck, breast, and abdomen glossy greenish black, rest of back, wings, tail, and under coverts deep chestnut. It is now very uncommon.

Tooth-ornament, a decoration peculiar to mediæval architecture, consisted of four-leafed flowers, the centres of which project in a point. These are used in series, either in a continuous row or at slight intervals, and are generally inserted in a hollow molding. They are used in great profusion in the Early English architecture, forming one of its characteristic features, and in some of the richer suits of molding the flowers are very thick and the series is repeated several times.

Tooth-shell. See Dentalium.

Toothache, an affection of the teeth arising from various causes. Inflammation of the fangs of the teeth is a common cause, having its seat either in the soft membrane covering the fang, or in the pulp of the tooth. The tooth in this case often feels loose in the socket, and is very tender when touched. If the inflammation is not reduced matter forms, and the result is a gum-boil. Caries is a frequent cause of toothache, the central part of the tooth rotting away and exposing the nerve. Neuralgic toothache is a purely nervous variety, and may occur either in sound or carious teeth. It comes and goes suddenly in paroxysms, and is accompanied by little or no swelling. There are many so-called remedies for toothache, but they are very often of merely temporary benefit, and in the end do more harm than good. One of the best palliatives is obtained by pushing a little cotton dipped in chloroform into the cavity. As a preventive against toothache the teeth should be kept scrupulously clean, and when they show symptoms of decay the services of a skilful dentist should be secured. The decay of a tooth is often arrested by stopping or filling up the cavity.

Toothache Tree. See Aralia.

Toothed Herring. See Mooneye.

Toothpick, a sharpened instrument of wood or other material for removing substances lodged in the teeth. The ordinary toothpick is of wood about the size of a friction match, but longer and slenderer and pointed at one end or both. The use of wooden toothpicks has become very common in the United States and many millions of the tiny wooden slivers are manufactured there every

year. The seat of this industry is in Maine, near the forests of white birch, which wood is chiefly employed in their making. The felling of "toothpick trees" is not a separate business but one incidental to the Maine lumbermen. After a tree has been felled the branches are lopped off and only the trunk is sent to the mills. There the bark is skinned and the naked trunk is cut by machinery into thin sheets of wood of the thickness of toothpicks and as wide as a toothpick's length. These sheets, known as "veneers," are run through another machine which in one operation cuts them into toothpicks ready for shipment. Of the better grade of toothpicks large importations are made every year from Japan and from Portugal. The Portuguese toothpicks are made of orange-wood and are smaller but tougher, better shaped and more finely pointed than the domestic picks. The Japanese make their toothpicks from fine reeds, which they shave down to the thinness of paper, retaining the reed's strength and pliability. Metal toothpicks, which were common in the 17th century, are now little in demand since their use endangers the enamel of the teeth.

Toothwort. See DENTARIA.

Toowoomba, too-woom'ba, Australia, a town of Queensland, in the southeastern part of the state, 100 miles by rail west of Brisbane. It has a number of churches, two colleges, and other educational institutions, and a fine new municipal building. There are flour-mills, saw-mills, and a brewery, and in the neighborhood are vineyards. Pop. (1901) 9,137.

Top-minnows, a group of small, robust minnows, represented by *Gambusia patruelis* of the brackish waters along the Atlantic coast, which are distinguished by their habit of swimming and feeding near the surface.

Top-shells, the *Turbinidæ,* a family of gasteropod mollusks, mostly tropical and oriental, in which the shell is usually turbinate or top-shaped, but may be pyramidal. It is generally nacreous internally. The operculum is horny, and may exhibit a spiral form. In the genus *Turbo* the shell is top-shaped with a rounded base. The whorls are convex, and the aperture is large, the operculum being calcareous. The genus *Trochus* also belongs to the top-shells. In the latter genus the shell is pyramidal and the base flattened, the operculum being horny. The common top is the *T. zizyphinus.* Others are the *T. versicolor,* the *T. imperialis,* and the *T. niloticus.* After having been ground and polished to exhibit the nacreous inner layers, they are extensively sold as ornaments.

To'paz, a mineral having the composition of an aluminum fluo-silicate. It is not the topaz of Pliny and other early writers which was chrysolite (q.v.), the names having been interchanged. It generally crystallizes in orthorhombic prisms, colorless, white, yellow, or occasionally pale green or blue. Transparent topaz, in any of its tints, is a beautiful gem. The colorless variety much resembles diamond, and is sometimes sold for it, though its lower hardness (8) affords an easy test. What has been called the largest diamond in the world, among the crown-jewels of Portugal, is probably a colorless or "white" topaz. The yellow variety is most familiar, and is called "Brazilian topaz," in distinction from "Oriental topaz" (yellow sapphire) and "false," "Scotch," or "Spanish topaz" (yellow quartz). The "Oriental topaz" is much rarer, harder (9), and denser (about 4); while the "Spanish topaz" is cheaper, less hard (7), and lighter (2.65), the density of topaz being 3.4 to 3.6. It is also distinguished by its eminent basal cleavage. The favorite shade is wine-yellow or sherry-color. Both yellow and blue topaz fade and become white by weathering or exposure to light, and some yellow varieties can be changed to a pale pink by heating, yielding the so-called "burnt topaz" or "Brazilian ruby," resembling the pale, or Balas, variety of ruby spinel (q.v.). Topaz occurs usually in metamorphic rocks, like gneiss, but also somewhat in igneous rocks; it is frequently, though not always, associated with tin-ore. The principal localities are in Siberia, Japan, Brazil, and Mexico. In the United States it occurs in large masses at Stoneham, Maine, and Trumbull, Conn.; in crystals in Colorado and Utah. Fine topaz crystals, colorless and pale blue, have recently been found in San Diego County, Cal.

Topaz'olite, a variety of andradite garnet, having a light yellow or pale grayish green color. The most beautiful specimens are found in the Ala Valley, Piedmont, Italy. They also occur in California.

Tope, a Buddhist monument intended for the preservation of relics. The oldest monuments of this kind are spherical or elliptical cupolas, resting on a circular or rectilinear base, with an umbrella-shaped roof, and sometimes with a series of roofs of this form which develop into a spire, pyramid, or other architectural ornament. In the interior is a cell or chamber for containing the box with relics; but in some cases no relics have been found, and it is supposed they have been buried underground. See also DAGOBA.

Topeka, tō-pē'ka, Kan., city and county-seat of Shawnee County, the capital of the State and one of its leading cities; on both banks of the Kansas River, and on the Missouri P., the Atchison, T. & S. Fé, the Union P., and the Chicago, R. I. & P. R.R.'s, 67 miles west of Kansas City and 45 miles west of Lawrence. The city is well laid out with broad streets, crossing at right angles.

History.— Topeka was settled by people from the "Free States" in 1854; an anti-slavery constitution was adopted here in 1856, known as the "Topeka Constitution," and the "Topeka Government" was established, but shortly abolished by national authority. It was incorporated as a city in 1857, and was selected as the State capital in 1861.

Industries.—There are many coal mines and stone quarries in the vicinity which are profitably worked, giving employment to a large number of persons. The repair shops and works of the Atchison, Topeka & Santa Fé Railroad, and several flour mills are the most important industrial establishments. According to the census of 1900, Topeka had 399 manufacturing estab-

lishments with a combined capital of $3,891,350; $725,372 of this capital was invested in flour and grist mills; other industries include foundries and machine shops, ice manufactories, lumber mills, and boiler factories. There are several savings banks, state banks and a national bank. The city is also an important centre of wholesale trade, and one of the chief railroad centres between the Missouri River and the Far West.

Public Buildings and Charitable Institutions. — The State Capitol, a handsome stone edifice, is the most important building of the city; the national government building, the court-house and the city hall are also worthy of note. Two miles to the west of the Capitol is the State Asylum for the Insane; the State Reform School is also located in Topeka. There is also a private insane asylum and a number of other charitable institutions, including a home for aged women, Detention Hospital, the Santa Fé Railroad Hospital, Christ Hospital, and the Stormont Hospital, the last mentioned having a nurses' training school.

Educational Institutions.— The city has a large public library, and a well organized public school system, including a high school established in 1874. It is the seat of Washburn College (q.v.), of the College of the Sisters of Bethany, and of the Kansas Medical College.

Government.—The government is vested in a mayor and a city council; members of the board of education are elected by the direct vote of the people; heads of departments are appointed by the mayor, with the approval of the council. There is a well equipped fire department, and an excellent police department; the waterworks and electric light plant are owned by the city. The chief item of public expenditure is for public schools, about $102,000; other items are $33,000 for streets; $28,000 for the fire department, and $23,000 for the police.

Population.—The city had a population in 1870 of 5,790; (1880) 15,482; (1890) 31,007; (1900) 33,608.

Topelius, tō-pā'lē-oos, **Zachris,** Finnish author: b. Kuddnäs, near Nykarleby, 14 Jan. 1818; d. Helsingfors 12 March 1898. He was graduated at the University of Helsingfors in 1840, in 1841–60 edited the 'Helsingfors Fidningar,' in which many of his earlier writings first were printed, and held at the university the chairs successively of Finnish history (1854–63), of the history of Finland and the northern regions (1863–76), and of general history (1876–8). After Runeberg (q.v.), he is the chief poet of Finland. His religious and patriotic lyrics are particularly valued. Among the collections of his verse are 'Flowers of the Heath' (1845–54); 'New Leaves' (1870). He wrote also several dramas, such as 'After Fifty Years' (1851), and works of fiction, including 'A Surgeon's Stories' (1853–67), a cycle based on Finnish and Swedish history from the time of Gustavus II., Adolphus, to that of Gustavus III. There are German translations of several of his writings, and an English version of the 'Surgeon's Stories' has appeared in the United States (1883–8).

To'phet, a locality described in Scripture as in the valley of Hinnom, near Jerusalem, where high places were erected, and which was the chief seat of the worship of Moloch, with its fiery human sacrifices and abominations. The good king Josiah suppressed that form of idolatry, and made Tophet a receptacle for the refuse of Jerusalem. Afterward it became a burying-ground. It was shunned with horror by the Jews, and the word has come to be used by Christians as the synonym of a place of punishment after death. The origin of the word is doubtful. It is derived by some from Hebrew *toph,* a drum, in allusion to drums beaten to drown the cries of children burnt in the fire to Moloch, and this seems a probable interpretation. Another derivation is from an Aramæan word signifying to spit or vomit, in allusion to the disgust excited by the place.

Topic, commonly only the subject of a discourse, whether written or spoken; the matter treated of in conversation, argument, oration, literary composition, etc. In rhetoric and logic topic was restricted to the narrower sense of a common ground of argument, a general maxim or dictum from which other arguments may be started: one of the various general forms of argument employed in probable reasoning, as distinct from demonstrative reasoning. In medicine the word is used to denote any remedy locally applied; it is, however, more frequently used in the plural, topics, denoting the class of such remedies, than applied to any one specific.

Top'lady, Augustus Montague, English theologian and hymn writer: b. Farnham, Surrey, 4 Nov. 1740; d. London 11 Aug. 1778. He was educated at Westminster and Trinity College, Dublin, and in 1768 was presented to the vicarage of Broadhembury, Devonshire. Though a voluminous writer — and a strenuous defender of Calvinism against John Wesley — Toplady is now hardly known except as the author of the hymn 'Rock of Ages,' one of the finest expressions of evangelical faith and fervor to be found in all hymnology.

Topographical Surveying. See SURVEYING.

Topolobam'po Bay, Mexico, a small bay of the Gulf of California on the west coast of the state of Sinaloa. It is noted on account of the attempt made in 1886 by a number of Socialists of the United States to form a co-operative community on its shores. A company was chartered, in which all the colonists were stockholders, and which was to own all the land, and conduct all the business of the community. Everything was to be done as far as possible on the socialistic plan as described in Bellamy's 'Looking Backward.' Several hundred colonists joined in the experiment, and a city was surveyed and laid out on an elaborate plan. The experiment, however, was a failure, largely owing to aridity of the land and the absence of available streams for irrigation. The place was abandoned in 1891.

Top'ophone, an instrument for determining the direction from which any sound proceeds. It is valuable for use at sea, during fog, or in the night, to determine the direction of a sounding bell, fog-horn, whistle, etc. The topophone was invented by A. M. Mayer, and consists, briefly, of a horizontal bar turning freely on a pivot at its centre, and having at each end of the bar resonators, with their openings facing the same way, each with a connecting sound tube for the ears of the observer. In use the

bar is turned until a position is found in which the sound is loudest and equally distinct in each ear. The location of the sound is at a right angle to the bar in the direction to which the resonators face.

To'rah, or Thorah. See PENTATEUCH.

Tor'bane Hill Mineral, a lustreless variety of cannel coal, of a dark-brown color, yellowish streak, sub-conchoidal fracture, hardness of 2.25 and specific gravity 1.2. It is especially rich in volatile matter and has, therefore, been used in the manufacture of illuminating gas, paraffin and lubricating oils. It occurs at Torbane Hill, near Bathgate, Scotland, but the supply is apparently nearly exhausted. It is also called Torbanite and Boghead Cannel.

Tor'banite. See TORBANE HILL MINERAL.

Torbert, tôr'bẽrt, Alfred Thomas Archimedes, American soldier: b. Georgetown, Del., 1 July 1833; d. at sea off the coast of Florida 29 Sept. 1880. He was graduated at West Point in 1855, was engaged on frontier duty in Texas, Florida, New Mexico, and Utah in 1855–60, and at the outbreak of the Civil War was assigned to the duty of mustering in volunteers. He was commissioned colonel in 1861, and led his regiment in the Peninsula campaign of 1862; was assigned to the command of a brigade in that year; and participated in the second battle of Bull Run and in the battles of South Mountain and Antietam. He was promoted brigadier-general of volunteers in 1862; commanded a brigade at Gettysburg in 1863; for gallantry there was brevetted major in the regular army; in April 1864 was transferred to the cavalry service and placed in command of the 1st division of the Army of the Potomac. He commanded the cavalry in many subsequent engagements, including those at Hanovertown, Milford, Winchester, and Waynesboro. In 1864 he was brevetted major-general of volunteers, attaining the same rank in 1865 in the regular army. In 1866 he was mustered out of the volunteer service and resigned his regular army commission. He was United States minister to the Central American States 1869–71, was transferred as consul-general to Havana, Cuba, and in 1873–8 was consul-general in Paris. He was lost in the foundering of the Vera Cruz off the coast of Florida.

Torcello, tôr-chĕl'lō, Italy, an island in the lagoon of Venice, six miles above the city. It is the see of a bishop and possesses an ancient Byzantine cathedral of Santa Maria of the 7th century, with mosaics of the 12th century, curious altar-benches, an antique crypt, octagonal baptistery from 1008, and a belfry; Santa Fosca is another handsome church with a fine interior (12th century). Pop. 130.

Torgau, tôr'gow, Germany, a town in the province of Saxony, Prussia, on the Elbe, 48 miles by rail northeast of Halle. Prior to 1889 it was a fortified town, and has considerable historical significance in connection with (1) the Alliance of Torgau, a confederacy formed in 1526 by Saxony, Hesse, and other German states in which Protestantism united for the purpose of defense against aggression on the part of their antagonists; (2) the Articles of Torgau, a declaration by Luther and his supporters in 1530, which was the foundation of the Augsburg Confession; (3) the Battle of Torgau, fought in the suburb of Luptitz 3 Nov. 1760, when the Prussians under Frederick the Great defeated the Austrians under Gen. von Daun; (4) the Siege of Torgau by Tauentzien in 1814, the city holding out for three months and surrendering 10 Jan. 1814. The Renaissance Hartenfels Castle of the 15th century was a former Electoral residence. In the town-hall is a museum of Saxon antiquities. Pop. (1900) 11,811.

Tor'mentil, an old provincial name for various species of *Potentilla* (q.v.), a plant supposed to yield relief from the torment of toothache.

Tornado. See CYCLONE.

Tornado Alarm, an apparatus which automatically gives an alarm when there is a sudden change of atmospheric pressure, such as precedes a tornado. It is a kind of barometer in which the main mercury tube has a cylindrical bulb at the top and is bent in the form of a siphon. Near the lower portion of its shorter member is a secondary tube, the connection being made by means of a short tube connecting with the main tube by a very small opening. The fluid in both the larger tubes will remain normally of equal, or nearly equal height in ordinary changes of the weather, but in case of sudden atmospheric changes the small opening in the connection between the tubes restricts the movement in the secondary tube as compared with that in the main tube. Such variation in the movement of the mercury in the two tubes when sufficient to indicate an approaching storm, is made to give an alarm by means of floats in the tubes connected with wires in an electric circuit, there being on one wire a fork and on the other a tongue, by which contacts are made, to ring an alarm when the points meet. This alarm is given some two minutes before the first blasts of the tornado. Ordinary storms have no effect at all on the apparatus.

Tornea Elf, tôr'nĕ-â ĕlf, Sweden, a river at the north, which rises in Lake Tornea. Part of its course forms the boundary between Sweden and Finland, and then empties into the Gulf of Bothnia, after a course of 275 miles. The town of Tornea stands at its mouth and on the opposite side of the river the Swedish town of Haparanda.

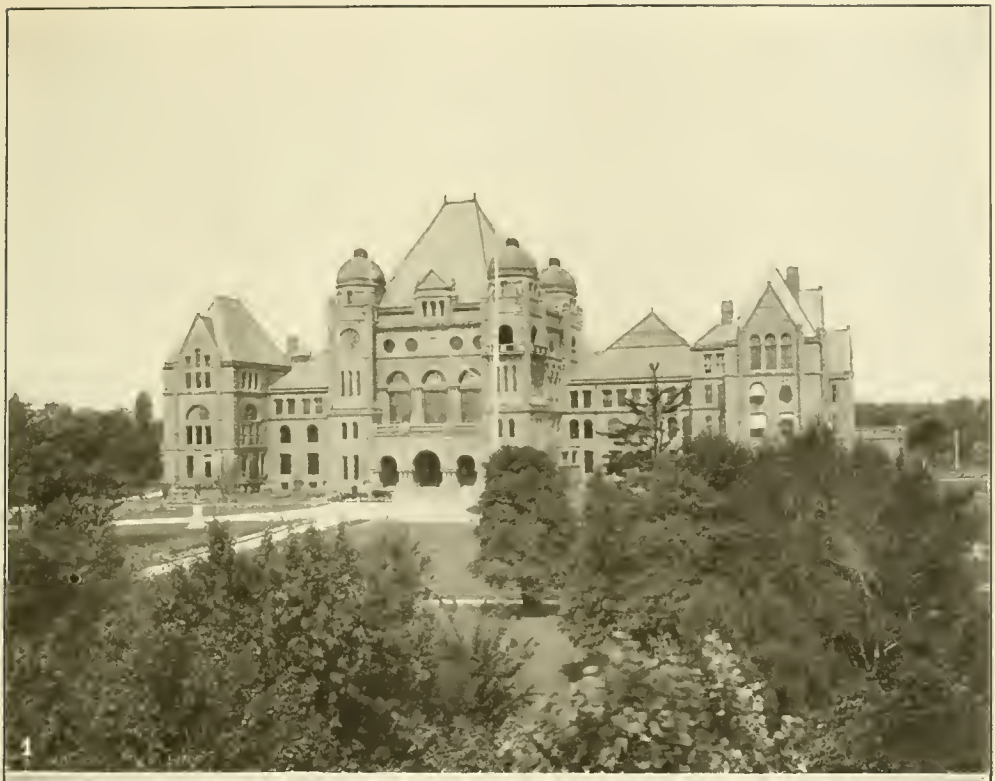
Toronto, Canada, a city and lake-port, the capital of the Province of Ontario, situated on the circular Toronto Bay between the mouths of the Don and Humber rivers, on the northwest coast of Lake Ontario, 313 miles west-southwest of Montreal, and 60 miles in a direct line northwest of Buffalo, U. S. It is the seat of the provincial government, of the higher law courts, of an important university, and of the Department of Education of the province; it is also the cathedral city of a Roman Catholic and of an Anglican diocese. In commercial importance it is the second city in the Dominion, and, after Montreal, the chief railway centre. The Grand Trunk, and Canadian Pacific, and many branch lines connect it with the principal cities of Canada and of the northern United States, and it is the headquarters of the projected trans-continental line, the Canadian Northern. The fine harbor, five miles long and one and a half wide, is formed by a long, low, sandy island, protected by imposing break-

waters; this island is, in summer, a favorite bathing and boating resort. The city rises gradually from the water's edge to a height of 220 feet; it extends from east to west for about eight miles along the lake shore and in places some three miles inland and covers an area of about 18 square miles, with streets crossing each other at right angles. An electric street railway system has about 90 miles of tracks. The architecture, especially of the numerous public buildings, is tasteful and imposing, and there are many fine shops and residences. Brick of a pleasing light color, or red, is the chief building material. Of the public buildings, the most striking group is that connected with the University of Toronto. The main building or University College, a fine Norman structure in gray stone, with a massive tower and richly sculptured doorway, was rebuilt after partial destruction by fire in 1890; the Library, the new Medical Building, the Biological Department, the School of Practical Science, with its handsome new engineering building in the Renaissance style, and a number of other large structures, unite with this to make up an imposing group, not wholly harmonious, but in a spacious setting of park land. Adjacent are the "Neo-Greek" Parliament buildings, containing the government offices, and a handsome and well-decorated legislative hall. The magnificent new city-hall and court-house is, next to the university, the most striking of Toronto's buildings. Others worthy of mention are Osgoode Hall, the seat of the provincial law courts; the Normal School buildings, containing offices of the Department of Education, model schools, and an educational museum; Trinity College, in connection with the Church of England, an ornate building, in the late Gothic style; the Custom House, the Post-Office, the Exhibition Buildings, where an important annual agricultural exhibition is held, and the immense Lunatic Asylum, in about 40 acres of ground. The churches most worthy of notice are the Roman Catholic and Anglican cathedrals, both in the Pointed style; the latter is an excellent specimen of Early English. There are five theatres and many public halls, the chief being the Massey Music Hall, which will hold 4,000 or 5,000 people. Toronto has 1,329 acres of park, the chief being Queen's Park, adjoining the university, and the extensive High Park, at the west of the city. It is a great educational centre. The university (see following article) is one of the best equipped in America. Educational institutions connected with it are Trinity College (already mentioned); Victoria College (Methodist, Arts and Divinity); Knox College (Presbyterian theological); Wycliffe College (Anglican theological); St. Michael's College (Roman Catholic), and colleges for instruction in music, dentistry, pharmacy and veterinary science. Its agricultural college is situated not at Toronto but at Guelph, Ont. McMaster University is an independent Baptist institution, teaching arts and divinity. Upper Canada College, in spacious grounds, is a residential school for boys, as is also St. Andrew's College, with extensive new buildings now in course of erection. Havergal College is a similar type of school for girls, and besides it are Bishop Strachan's School, St. Margaret's College, etc. The Toronto Conservatory of Music has a very large number of pupils. The Observatory, at which the weather reports for the Dominion are made up, is in the university grounds. The city has a garrison of regular soldiers consisting of a mounted and an infantry corps. In addition there are two mounted corps of militia and three infantry battalions. Toronto has suffered from destructive conflagrations, notably in 1849, in 1890, and in April 1904, when more than 100 buildings in the wholesale business section were burned down, some 5,000 persons were thrown out of work, and about $11,000,000 worth of property was destroyed. The industries of Toronto include a great agricultural implement factory, iron-foundry, ship-building, rolling stock, distilling and brewing, pork-packing, the manufacture of soap, boots and shoes, etc. Shipping on the Lakes is laid up in winter, but during the navigable season several lines of steamers connect with the principal ports on the Great Lakes and the Saint Lawrence. The lake commerce in lumber, grain, coal, cattle, and fruit is large. Between 1870 and 1900 the imports of Toronto increased from a little over $7,000,000 to over $31,000,000; while the exports increased from $1,000,000 to over $9,000,000. The receipts at the Toronto Custom House are now about $8,000,000 annually.

The name Toronto is derived from the Huron word, signifying "place of meeting." In 1749, when the French were establishing a chain of forts or posts through all the West and down the Mississippi Valley, Fort Rouillé was founded, on a site even then often called Fort Toronto. In 1756 this fort, on the west side of the present city, was destroyed to prevent its falling into the hands of the English. In 1793 Governor Simcoe finding Niagara or Newark, which lay almost under the guns of an American fort, too close to the frontier for the seat of government, removed the capital to the other side of Lake Ontario, and established his headquarters in a tent, on a site in the eastern part of the present city. In 1813 Toronto, called York by Governor Simcoe, was captured and partially burned and looted, twice in the same year, by the American army and navy. In the first capture the American General Pike, the discoverer of Pike's Peak, together with many soldiers, was killed by an explosion. In 1834 Toronto was incorporated as a city with its present name. In 1837 it was the chief scene of a brief and ineffectual rebellion under William Lyon Mackenzie (q.v.). At that time and often since Toronto has shown itself to be fervently British in sentiment. Its later history has been purely civic, without other interest than that attaching to prosperous growth. A pleasant society and an attractive situation make it a favorite place of residence. Population has increased rapidly. In 1793, when Governor Simcoe landed, there were only a few families. In 1834 the population was less than 10,000. In 1861 it had increased to 44,821, in 1871 to 56,092, and in 1881 to 86,415. In 1891, including some annexed suburbs it amounted to 181,220, and in 1903 to 266,989.

Consult: Scadding, 'Toronto of Old'; Scadding and Dent, 'Toronto, Past and Present'; Adam, 'Toronto, Old and New.'

George M. Wrong,
University of Toronto.



1. Ontario Parliament Buildings.

2. The University of Toronto.

Toronto, Ohio, village in Jefferson County, on the Ohio River, and on the Pennsylvania railroad; 10 miles above Steubenville, the county-seat. It is in a region in which there are extensive beds of clay, and large stone quarries. It is near the natural-gas fields of West Virginia. The chief manufacturing establishments are potteries, brick and tile works. The shipments are chiefly pottery, sewer pipe, terra-cotta and fire-brick. Pop. (1890) 2,536; (1900) 3,526.

Toronto, University of, situated at Toronto, Canada, the head of the educational system of the Province of Ontario. The first step toward the establishment of the university was taken in 1797 when the Council and Assembly of Upper Canada petitioned the king for an appropriation of crown lands for the purposes of education, and the establishing of a university. The appropriation was made, but nothing further was done toward the founding of the university until 1827, when it was chartered under the name of the University of King's College; the organization of the university was further delayed, largely owing to objections to the sectarian character of its charter, which was amended in 1837; and it was not till 1843 that it was opened to students. In 1849 the name was changed to the University of Toronto; in 1853 the university was further transformed by the organization of two corporations, known as the University of Toronto and the University College; to the latter was assigned the teaching in arts and the entire control of its students; in 1887 a second reorganization transferred a part of the teaching in arts to the university faculty, and more closely federated the institutions which had previously been affiliated with the university; these affiliated institutions were mostly denominational colleges. Since 1887 there have been affiliated Victoria University at Cobourg, and a number of technical and professional schools, including the Ontario Agricultural College, Royal College of Dental Surgeons, the College of Pharmacy, the Toronto College of Music, the School of Practical Science, and the Ontario Veterinary College. These affiliated colleges are entitled to representation on the University Senate, which has charge of the educational policy. The University Council, which has charge of the discipline and control of students, etc., is composed of the heads of the teaching departments in the university, and of the scientific arts and theological colleges. In 1903 took place the federation of the University of Trinity College, with the University of Toronto. The university proper includes a faculty of arts, a faculty of law, a faculty of medicine, and a faculty of applied science and engineering. It also has instituted courses and examinations for degrees in dentistry, pharmacy, agriculture, music, pedagogy and household science; and other courses leading to diplomas only in commerce and gymnastics. University extension work is conducted by a special committee of the University Senate at local centres. Women are admitted to the university. Among the important buildings are the main building, the library, and the chemical, biological, and medical buildings. The students in arts, medicine, and applied science in the University of Toronto numbered 2,135 in 1904.

Torpedo, a genus of rays of the family *Torpedinidæ*, most remarkable for their electric organs, which lie on each side of the head (see ELECTRIC FISHES). The electric shock is powerful enough to kill small animals, and specimens two or three feet long can by a single discharge disable a full-grown man. The family, which includes about 7 genera and 15 species, is widely distributed over the Atlantic and Indian Oceans; *T. marmorata* and two others are common in the Mediterranean, and *T. hebetans* reaches the south coasts of Britain. The American form most often seen is *T. occidentalis*, which may reach a weight of 200 pounds; it is uncommon, but occasionally seen along the coast from Cape Cod to Cuba.

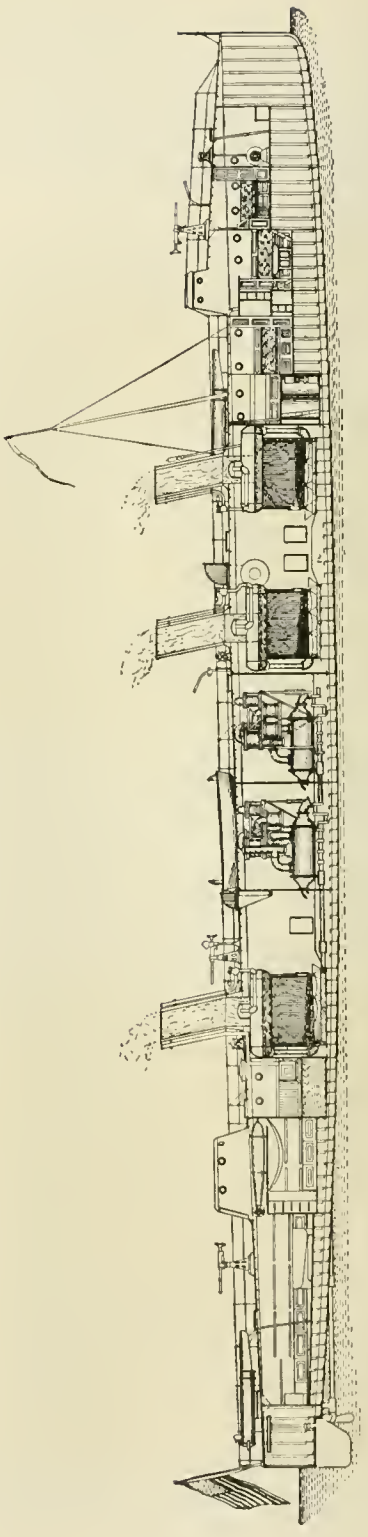
Torpedo Boats. The boats first used in torpedo attacks were ordinary steam launches fitted with Spar torpedo. They were about 30 feet in length and capable of a speed of 5 to 7 knots. When making an attack they were generally fitted with an improvised protection of boiler iron against rifle shots. It was not until 1877 that boats were specially designed and built for this work. These boats were built of steel and were from 60 to 80 feet long, 8 to 10 feet beam, and 3 to 5 feet draft, with a speed of 15 to 18 knots. They were intended for harbor defense or off shore work in fair weather. A number of this type were employed by the Russians in their attacks upon the Turkish ships in the Black Sea, using both the Spar torpedo and the Whitehead automobile torpedo. All naval powers of any note added torpedo boats to their navy lists, and the size, power, and speed of the boats gradually increased. Ten years later boats were being constructed 140 feet long and a speed of 24 knots and more than 1,000 boats of various types had been added to the navies of Europe. The torpedo boat of the present day has attained to a length of 160 feet and a speed of 28 knots.

The general construction of a torpedo boat is shown in the illustration. It is built entirely of steel, the plates varying from 1-16 to ⅜ in. in thickness. The boat is divided into a number of water-tight compartments by steel bulkheads, so that even if one or two are filled with water it will not sink. In the bow is the collision compartment, which remains continually closed and is not accessible for general use. The second compartment is assigned as the living quarters of the officers or crew. These quarters are fitted with folding berths, wash-stand, table, and a few drawers to store necessary articles of clothing, charts and navigating instruments. On the deck at the after end of this compartment is the conning tower, through which access is obtained to the living quarters. This conning tower is made of bullet-proof steel and in the larger boats and destroyers a rapid-fire gun is mounted on top of it. Within the tower are placed the compass, the steering wheel and engine, the signals and speaking tube to the engine rooms, and the electric key for firing the torpedoes. Dead lights of heavy plate glass are fitted around the sides for the use of the helmsman. Abaft the forward living quarters is a compartment for some of the chief petty officers of the crew. The forward boiler compartment contains two water tubular boilers of the Thornycroft pattern, supplying steam at a pressure of 250 lbs. per square inch. The coal is

stowed on each side in wing compartments extending up to the deck, and when full of coal they form a good protection to the boilers against small projectiles. Entrance to the boiler compartment from deck is through an air-tight hatch and the draft to the boilers is supplied by a blower engine which draws the air down through a hood on deck, forcing it up through the furnaces and smokestacks. Abaft the boiler compartment is the engine space, on each side of which in the wings is a continuation of the coal bunkers giving some protection to the machinery. The engine space is divided into two water-tight compartments, with one main engine in each compartment. If either engine is disabled the boat will still be capable of making 18 or 20 knots speed. In the engine space is also placed the auxiliary machinery, such as pumps, dynamos, and air compressors for charging torpedoes. The after boiler compartment is next abaft the engine space. The steam piping is so arranged that each boiler may be cut off in case of accident or act independently of the other. The galley, where all the cooking for officers and crew is done, is between the after conning tower and after boiler space. On many boats this galley is placed forward or on deck. The after conning tower is similar to the forward one, containing duplicate steering gear, compass, etc. Beneath this conning tower and extending further aft is the living quarters for the crew, which are fitted with folding bunks, clothes lockers, mess table, etc. Provision is also made for stowing spare torpedoes and ammunition for the rapid-fire guns. Last of all is the rudder compartment for the rudder post, helm, steering ropes, etc.

On the deck of the boat at the forward end is a rapid-fire gun, and a capstan and anchor davit for handling the anchors. On account of the rounded form of this part of the deck forward of the conning tower it is generally known as the "turtle back." Abaft the conning tower is a small signal mast. The two or three torpedo tubes are placed in the most available deck space and on the midship line when possible. The tubes revolve on a circular track on the deck so that the torpedoes may be discharged into the water from either side and in a direction from well forward to well abaft the beam. Davits are fitted so that the torpedoes may be hoisted on board after a practice run. One or two small boats are provided and at sea these are hoisted in on deck. All hatches are made so that they can be quickly closed and are fitted with rubber gaskets so that the seas may break over the boat without the water getting below. The deck is flush and is surrounded by a light wire railing as a protection against the crew being washed overboard.

Torpedo Boat Destroyers.—The development of torpedo boats and their great capacity for inflicting injury to the powerful and expensive fleets of battleships gave rise to the destroyer. These were intended to protect the larger vessels from attack by driving off or destroying the torpedo boats. They are practically an enlarged torpedo boat, about 250 feet in length and between 400 and 500 tons displacement. This greater displacement enables them to carry a comparatively powerful battery of 6-pounder or 14-pounder rapid-fire guns and at the same time give them a speed of 28 to 30 knots an hour. In addition to this they are generally



A Modern Torpedo Boat.

TORPEDO BOATS FIRING A WHITEHEAD.

fitted with two torpedo tubes mounted on the midship line and firing from either side. They can thus be utilized in torpedo attack and keep the sea in all weather operating far from a base.

Torpedo Boat Warfare.—During the days of the spar torpedo in the American Civil War, the Russo-Turkish war, and the war between France and China, there were 15 attacks made by torpedo boats with this weapon. Twelve of these attacks were made at night and three by daylight. There were 33 torpedo boats engaged in these attacks and the number of men employed was about 350. Three boats were lost and 12 men were killed. On the other hand, they succeeded in sinking four ships and injuring three, with a total loss of over 400 lives. At that time ships were armed with muzzle-loading smooth bores, howitzers, and machine guns. Since the advent of the Whitehead torpedo the armament of ships has undergone a radical change and all are now well supplied with a secondary battery of rapid-fire guns each capable of firing 10 to 15 shots a minute. There have been nine attacks made by torpedo boats or destroyers using the automobile Whitehead, and this number does not include those in the war now pending between Japan and Russia. Twenty-seven boats were employed, but only 16 were under fire and discharged their torpedoes. Two boats were lost and of the 500 men engaged in the nine attacks less than 2 per cent were killed. On the other hand, eight vessels were sunk, including one battleship, two armored cruisers, three protected cruisers, a tug boat and a schooner. See TORPEDOES.

The following table shows the number of boats possessed by some of the principal naval powers:

	Destroyers 180 ft. to 250 ft.	1st Class 80 ft. to 180 ft.	2d and 3d Class 60 ft. to 80 ft.
England	145	90	90
France	42	228	107
Germany	29	103	26
Russia	58	103	112
Japan	20	73	...
United States	20	25	5

F. F. FLETCHER,
Commander United States Navy.

Torpedo Drag, a device for clearing harbors, river-channels, etc., from floating torpedoes and submarine mines. It consists of a long cable bearing grappling hooks set at frequent intervals. The ends of the cables are made fast in boats, one on either side of the channel, and as the vessels proceed up and down the channel, abreast, the hooks on the rope between them catch the torpedoes. Sometimes a drag note is thrown ahead of a vessel by a small mortar and is drawn in by a windlass; this is to clear the channel through which the vessel must pass. See TORPEDO NETS.

Torpedoes. A torpedo has generally been known as a water-tight case containing an explosive designed to act against a ship's bottom. More recently a torpedo that is fixed in the water to defend a harbor, channel, or anchorage is called a submarine mine, but when it is so constructed that it can be placed or propelled against a ship it is known as a torpedo. A submarine mine is designed to act defensively and the torpedo to act offensively. This mode of warfare was first advocated by Dr. Bushnell in 1777 and later by Robert Fulton. The experiments of these pioneer inventors demonstrated the destructive effect of submarine explosions against a ship's bottom. It was not, however, until the American Civil War that these methods came into successful and practical operation. By means of submarine mines 28 vessels were sunk or seriously injured. These mines generally consisted of a small keg or metal case containing 50 pounds or 100 pounds of gunpowder, and many ingenious devices were employed to explode them upon coming in contact with the ship. This was the commencement of the modern system of submarine mining for harbor defense, which has been brought to a high state of perfection and without which the fortification of no seaport is complete.

The Spar Torpedo.—The first successful type of torpedo came into existence during the American Civil War and was known as the spar torpedo. It was successfully used with small boats or launches and consisted of a metal case, cylindrical in form, containing 50 to 70 pounds of fine black powder. This was secured to the end of a wooden spar about 30 feet in length. The launch or torpedo boat was so fitted that this spar could be rigged out ahead and the end lowered into the water, thus bringing the torpedo in contact with the ship's bottom. The torpedo would then explode, either by contact or by a trigger operated from the boat. (See Fig. 1.) The first attempt to destroy a ship by this means was made against the United States cruiser Ironsides, lying on the outside blockade off Charleston in 1863. The probability of an attack of this kind was known and extra lookouts were stationed. The attacking torpedo boat was a cigar-shaped launch with a speed of six or seven knots and a crew of four men. It passed out of the harbor after dark unobserved by the Union fleet and approached the Ironsides from seaward. The boat got alongside and successfully exploded her torpedo, severely injuring the ship, but not sufficiently to be withdrawn from service. The explosion partly filled the boat with water, which drifted away, the crew jumping overboard. Two of them were captured and the other two subsequently regained the boat, re-lighted the fires, and returned safely to Charleston. The second attack was made against the United States cruiser Housatonic, also on the outside blockade off Charleston. The vessel was prepared for the attack with lookouts doubled, cables ready to slip, and engines ready to start upon signal. The boat used on this occasion was a submarine, but at the time it was operated as a surface boat. It was 35 feet long, 3 feet beam, and 5 feet deep. It was propelled by eight men working a screw propeller, while a ninth man steered the boat and exploded the torpedo. There were two small circular hatches, one forward and one aft, and at the time of the attack these were open. Three minutes after discovery the boat got alongside under the fire of the ship and succeeded in exploding the torpedo. The Housatonic was sunk with a loss of five lives. The torpedo boat was filled with water by the

explosion and drawn down by the sinking ship, and its crew of nine men were drowned. Two more attacks with small boats and spar torpedoes were made against the Memphis and Minnesota, and were but partially successful. The last attack in this war was the well known case of that against the ironclad steamer Albemarle, by Lieutenant Cushing. The ship was secured to a wharf eight miles up the Roanoke River and surrounded by booms 30 feet from her side. The river was guarded by picket boats and lookouts along the bank. The torpedo boat employed was a 10-knot steam launch with a crew of 23 men. The sketch shows general plan of boat and spar torpedo. After passing the lookouts on the river the boat went full speed against the boom, breasting it in, and the spar was lowered so that the torpedo was successfully exploded against the bottom, sinking the ship. The explosion filled the launch with water and two of the crew were drowned.

The success of torpedo boat warfare was demonstrated in the American Civil War, and the Russo-Turkish war 13 years later found the Russians provided with improved boats,— small, handy, steam launches of 12 to 13 knots, a high speed for that day. In this war six attacks were made against Turkish men-of-war, only one of which was successful and sunk the ship. The last attacks with the spar torpedo were made by the French against the Chinese gun boats in Tonquin in 1885. Two Chinese vessels were sunk and many men of the crews drowned. This ended the day of the spar torpedo in its contest with the smooth bore, the machine gun, and musketry fire. Before it had disappeared mobile torpedoes and rapid-fire guns were already in the field and the same mode of warfare has continued under a change of weapons. The offense in the form of the modern automobile torpedo made a big stride in advance, and the defense followed quickly with the rapid-fire gun

Controllable Torpedoes.—The success of the spar torpedo in the Civil War gave rise to many inventions of controllable torpedoes, rockets, and submarine projectiles. None of these, however, have been extensively adopted or used successfully in warfare. The Patrick Torpedo consisted of a cigar-shaped case about 30 feet long and 24 inches in diameter, suspended about three feet below a similar vessel, which acted as a float. The motive power was carbonic acid gas and the torpedo was started, steered, or stopped by means of an electric wire which unwound from a drum within it. The Lay-Haight torpedo was similar to the Patrick, except that it had no float attachment, and all operations were performed by a single electric wire. The Sims-Edison torpedo, of the same type as above, was suspended from a boat-shaped float. The motive power was electricity, supplied from a dynamo at the starting point, operating a motor within the torpedo. Other types, such as the Ericsson, were controlled by compressed air, and the Nordenfeldt by storage batteries. The Harvey towing torpedo was a mine case containing explosive, and so shaped that when towed by a line from a ship or boat in motion it would diverge to an angle of 45 degrees from the stern. By thus passing near another vessel the torpedo could be brought in contact with her bottom and exploded upon striking. This torpedo was used in the Russo-Turkish war without success, and is now no longer in use. The Brennan torpedo is in use by the English government. It has two propellers, and on each shaft there is a reel of several miles of wire. An engine at the starting point unwinds the wires from the reels, causing the propellers to revolve at high speed, thus presenting the apparent paradox that the harder the wires are pulled back the faster the torpedo is forced ahead. The steering is affected by varying the tension on the wires. The Wickes, the Berdan, the Cunningham torpedoes and others (rocket torpedoes) were propelled by the escape of gas from a burning composition.

Automobile Torpedoes.—This type of torpedo contains its own motive power and propelling machinery, and is not under the control of the operator after being started toward the target. But three torpedoes of this type have proved a practical success,— the Whitehead, the Schwartzkopff, and the Howell. The Howell torpedo, the invention of Admiral Howell, United States Navy, is a cigar-shaped case formed of bronze about 11 feet long and 14 inches in diameter. The forward cone contains the explosive of 100 pounds of gun-cotton, which is detonated by a propeller-shaped plunger being driven back upon striking a vessel. The central portion contains a heavy fly-wheel which is geared up to the shafts of two propellers. In rear of the fly-wheel is situated the device for maintaining a constant depth while running beneath the surface. The motive power is obtained by spinning up the fly-wheel with a small turbine engine to about 10,000 revolutions per minute. This imparts a correspondingly high revolution to the two small propellers, and with the energy thus stored up a speed of 22 knots is obtained for a distance of 800 yards. As the number of revolutions of the fly-wheel diminish, the pitch of the propellers constantly changes so as to obtain more efficient results and a uniform speed over the distance. The torpedo is used to a limited extent by the United States government. The Schwartzkopff torpedo is in all essential respects the same as the Whitehead described below,

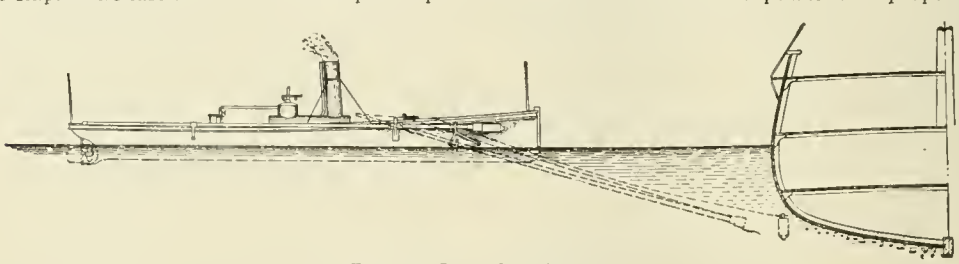


FIG. 1.— Spar Torpedo Boat.

differing from it only in detail of construction and in being made of bronze instead of steel.

The Whitehead Torpedo.—This torpedo is used in all navies of the world to the exclusion of nearly every other type. It was the invention of Mr. Whitehead, a superintending engineer at Fiume, Austria. It was successfully tried about 1867, at which time it had a speed of six or seven knots for several hundred yards, and, although somewhat uncertain in its action, it was reported upon as being fairly reliable up to 200 yards range. Since that time the power, speed, range, and accuracy have been gradually developed until the present time, when the torpedoes are required to make a speed of 30 knots an hour for a distance of more than half a mile and strike a ship within a few yards of the point aimed at. The Whitehead torpedo of today is a marvel of ingenuity and perfection of mechanical skill, and the limit of its development in power and range is not yet reached. This torpedo scored its first success in the Russo-Turkish war by blowing up a Turkish guard ship at Battuom in January 1878. The guard ship was anchored about half a mile outside of the fleet of seven men-of-war. The attack was made by two fast steam launches. Each launch discharged its torpedo at close range, both taking effect and sinking the vessel. The Chilean ironclad Blanco Encalado was sunk in water line. The impulse for this is obtained by exploding several ounces of powder in the rear end of the tube or by utilizing a reservoir of compressed air. As the torpedo leaves the tube a latch trips a valve in the torpedo and admits air to the engines. It plunges into the water at a speed of 25 to 30 feet per second and at once comes under the influence of its own motive power and guiding mechanism. Its weight when it is fired from the tube is about equal to that of sea water, but it may have either negative or positive buoyancy and yet maintain a fixed depth beneath the surface of the water. As the air becomes exhausted during the run the buoyancy gradually increases to 50 or 60 pounds, so that when the air is shut off at the end of the run and the engines stop the torpedo rises and floats on the surface. It may thus be recovered, re-charged, and fired repeatedly. By adjusting the mechanism of the torpedo it may be made to run at a high speed for a short distance until its power is exhausted, or at slow speed for a greater distance. It can be adjusted before firing so that the engines will stop at any given distance from the starting point and the torpedo then either sinks to the bottom or rises to the surface as desired. It can be made to run along the surface of the water or run at any desired depth less than 20 feet beneath the surface. A steering device keeps it on a straight course, and even if the

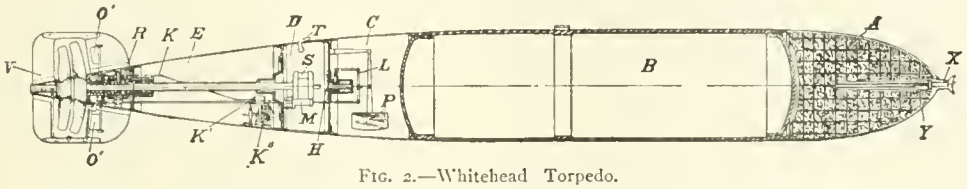


FIG. 2.—Whitehead Torpedo.

1893, and the Brazilian armored cruiser Aquidaban in the same year. At Wei-hai-Wei, during the war between China and Japan, one Chinese ironclad, two cruisers, one schooner, and one tug boat were sunk in two night attacks by the Japanese torpedo boats. In the Russo-Japanese war now in progress three large Russian men-of-war are reported to have been sunk or injured by Whitehead torpedoes in a night attack against the fleet anchored at Port Arthur. The number of vessels thus destroyed by this weapon will afford some idea of its great importance in modern naval warfare.

The Whitehead torpedo consists of a cylindrical steel flask, to the forward end of which is attached a pointed or conical head containing the explosive, and to the after end is attached the metal casing carrying the engines, propellers and operating mechanism. The more modern ones are about 16½ feet in length, 18 inches in diameter, and weigh nearly 1,250 pounds. They cost between $3,000 and $4,000. The motive power is supplied by charging the flask with air under a pressure of 1,500 pounds. The capacity of the flask is nearly 12 cubic feet. The weight of the air under the full pressure is over 90 pounds and has a stored up energy of more than 1,000,000 foot pounds. This is sufficient to propel the torpedo at a speed of 28 knots for a distance of 800 yards. The torpedo is projected into the water from a tube which may be either above or below the torpedo is accidentally deflected to the right or left from the line of fire it is immediately brought back to its original direction. By a modified steering device the torpedo can be made to turn through any angle to the right or left after entering the water and then pursue a straight course. The general form and sectional plan are shown in Fig. 2. There are five separate compartments: A, the war or exercise head; B, the air flask; C, the immersion chamber; D, the engine compartment; and E, the after compartment, containing the propeller gearing and steering device. The war head, A, is constructed of bronze and is secured to the air flask by a number of screws. It contains from 120 to 200 pounds of explosive, which is generally gun-cotton. In the forward end is placed the war nose, X, carrying the firing pin, and extending down to the centre of the charge immediately behind it is placed the primer, Y. The primer is exploded upon the screw fan coming in contact with the ship's bottom, and the primer in turn detonates the charge of gun-cotton. In order to insure against accident, the firing pin in the nose is not operative until after the torpedo has been fired from the tube and run some distance. The motion through the water revolves the screw fan and moves a traveling sleeve and nut so that not until then will the blow of impact be transmitted to the firing pin and primer. For practice runs the torpedo is fitted with an exercise head having a dummy

nose and is filled with water and ballasted to the same weight as the war head. The air flask, B, is a hollow forged-steel cylinder, with heads secured in each end and is capable of standing an internal pressure of more than 2,000 pounds to the square inch. For charging it with air there is fitted a check valve in the after head, and from this point a copper pipe leads to the starting valve of the engine. The immersion chamber, C, is so designated on account of containing the mechanism for keeping the torpedo at a constant depth beneath the surface. This mechanism is one of the most original and ingenious devices used in the torpedo and to which, more than anything else, the Whitehead owes its success. For many years this compartment was known as the "secret chamber," its contents being carefully guarded, and it is only within a few years that the construction of the device has been made known to the public. The torpedo is steered up or down in a vertical plane by a horizontal rudder placed abaft the propellers, and the action of this rudder regulates the depth at which it runs. The rudder is moved up or down by a rod leading to a small steering engine, M, just abaft the immersion chamber. The valve of this small engine is operated by the immersion mechanism, which consists of the combination of a hydrostatic piston, H, with a pendulum, P. The pressure of the water against this piston is resisted by a spring, the tension on which is equal to the pressure of the water at the depth it is intended to have the torpedo run. The controlling valve of the steering engine is connected to this hydrostatic piston and to the pendulum by a system of levers, L. When the torpedo is at the intended depth beneath the water and in a horizontal position the control valve of the engine is in mid position, giving enough down rudder to prevent the torpedo from rising. If, however, the torpedo is beneath its set depth, the pressure of the water forces the piston further in and moves the valve forward, throwing the rudder up and inclining the torpedo upward until it again reaches its set depth. In like manner, if the torpedo is running above its set depth the tension on the spring pushes the piston out against the pressure of the water, moving the control valve aft and throwing the rudder down. The action of this hydrostatic piston alone would thus keep the torpedo running at a fixed depth were it not for the fact that the action of the rudder when prolonged gives the torpedo such a great inclination up or down from the horizontal that it is apt to come to the surface or strike the bottom before it can recover. It is to obviate this that the action of the pendulum upon the control valve is introduced. If the torpedo is inclined unduly upward the pendulum forces the control valve aft, throwing the rudder down, which brings the torpedo back to the horizontal position. If inclined downward the rudder is thrown up. It is thus by the combined movement of the hydrostatic piston and pendulum, either working in unison or partly neutralizing the effect of each other, that the torpedo by the action of the rudder is maintained in practically a horizontal position at the depth for which it is set to run. The engine compartment, D, contains a three-cylinder engine acting upon a single crank of the shaft, S. The starting lever, T, is thrown back by a latch as the torpedo leaves the tube. In this compartment also is the distance gear for stopping the engine at any part of the run. This is accomplished by an eccentric with pawl and ratchet working on the shaft revolving a wheel which holds the valve open until the engine has made a given number of revolutions. The locking gear in this compartment holds the pendulum in its vertical position until after the torpedo has entered the water and attained to nearly its full speed. The object of this locking gear is as follows: The torpedo enters the water at a comparatively slow speed and at once takes up an acceleration under the influence of its own propelling power. This acceleration causes the pendulum to lag behind and thus give a down rudder, which would cause the torpedo to make a deep dive and strike bottom. The locking of the pendulum for the first 50 yards of its run overcomes this feature. The after compartment and buoyancy chamber, E, contains the engine shaft and propeller gearing. The two propellers revolve in opposite directions and this arrangement counteracts a tendency to change the course of the torpedo which would result from the use of one propeller. The after propeller is attached directly to the shaft and the forward one to a sleeve which revolves on the shaft by means of the bevel gears shown at R. The exhaust from the

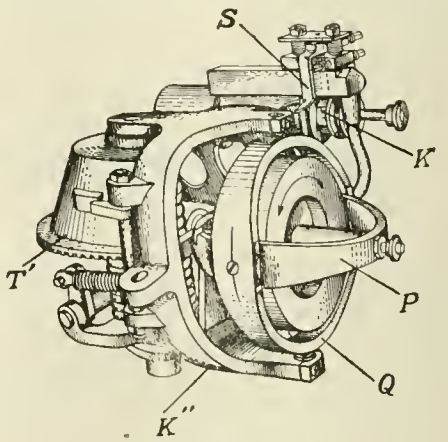


FIG. 3.—Obry Gear.

engine is through the shaft. The propellers are protected by horizontal and vertical blades, V, which also form a support for the rudders. On each side of the horizontal blade is a small adjustable vane. These vanes can be set so as to give the torpedo a tendency to steer to the right or left and thus counteract any opposite tendency due to eccentricity of form.

The torpedo as above outlined is a fairly accurate and reliable weapon, and when the mechanism is in satisfactory adjustment it will come within 35 feet of the point at which it is aimed 800 yards distant, and will maintain its immersion beneath the surface within less than two feet from the depth at which it is set to run. In actual service, however, it is difficult to maintain this complicated mechanism in such a state of adjustment that this degree of accuracy can always be attained. There has recently been introduced an ingenious steering device which goes far to overcome the eccentricities of the mechanism and render the tor-

pedo a weapon of precision. This is known as the

Obry Gear, or Gyroscope.— In the vertical tail blades of the torpedo are placed two rudders, O'O', capable of steering the torpedo to the right or left. These rudders are operated through the rod K by a small engine, K', which is part of a frame K" holding a gyroscopic wheel. The gyroscopic wheel operates the control valve of the small steering engine which moves the rudders to the right or left, thus steering the torpedo. This wheel and its operating mechanism are shown in Fig. 3. It is mounted in the two gimbal rings, P, Q. As the torpedo leaves the tube a spring is released and the toothed sector T', working in similar teeth on the axis of the wheel, spins it up to a high number of revolutions. Gyroscopic properties retain the wheel with the gimbal rings in a fixed plane. The small steering engine, K', is controlled by a circular valve to which is attached a lever S. A projecting pin on the ring Q of the gyroscope fits in the forked end of this lever. If, therefore, the torpedo turns to the right or left while the wheel and ring remain in the original plane of revolution, the valve will be turned to the right or left. This will throw the rudder over until the torpedo is brought back parallel to its original line of fire.

The Superheater.— The air in the torpedo flask after compression by cooling loses much of the power originally stored up in it. Successful attempts have been made to again heat this air by igniting alcohol in the flask at the instant the torpedo is discharged. The burning of the alcohol during the run of the torpedo, through heating and expanding the air, adds about 50 per cent more power and increases the speed or distance run accordingly. See Torpedo Boats.

F. F. Fletcher,
Commander United States Navy.

Torquay, tôr-kē', England, a fashionable watering place in Devonshire, situated on the south coast, 26 miles northeast of Plymouth. It is built on a series of terraces rising from the beach, and is a much frequented bathing and winter resort. It consists largely of villas and gardens, and has a fine promenade, public parks, libraries, a museum, electric light, and an excellent water supply and drainage system. There are manufactures of terra-cotta ware, and trade in coal and marble. Pop. (1901) 33,625.

Torque, an ornament of twisted gold or other metal, worn as a collar or a necklace by the ancient peoples of Asia and northern Europe. It consisted of a circle of stiff gold, twisted at all but the ends, which remained straight, or which in some cases were looped back, so as to overlap. Such collars were considered a characteristic ornament of the ancient Gauls, and are said to have been so abundant that about 223 B.C. Flaminius Nepos erected to Jupiter a golden trophy made from torques of conquered Gauls. The Torquati, a family of Manlian Gens, attribute their name to their ancestor T. Manlius, who having slain a giant Gaul in single combat lifted from the neck of the dead body an enormous gold torque, which he ever afterward wore upon his own.

Torquemada, Juan de, hoo-ān' dā tōr-kā-mā'thā (Latinized form Turrecremata), Spanish theologian and cardinal: b. Valladolid 1388; d. Rome 26 Sept. 1468. He entered the Dominican order in 1403, and was graduated at the University of Paris in 1424. After serving as prior at Valladolid and Toledo he was appointed by Eugenius IV. master of the sacred palace in 1431. In 1439 he became a cardinal-priest, later exchanged his title for the cardinal-bishopric of Albano, and still later (1464) for that of Sabina. He gave liberally of labor and money to charities and church-building, and won fame as a theological writer and controversialist. He was an influential member of the councils of Constance, Basel, and Florence, at the last-named of which he drew up the proposals for union between the Greek and Latin churches. Among his works may be mentioned 'Meditationes' (1467); Quæstiones Spiritualis Convivii Delicias præferentes super Evangeliis' (1477); and 'Commentarii in Decretum Gratiani' (1519). Consult: Lederer, 'Der spanische Cardinal Johannes von Torquemada' (1879).

Torquemada, Tomás de, Spanish monk, first Grand Inquisitor of Spain: b. Valladolid 1420; d. Avila 16 Sept. 1498. He entered the Dominican order, was for 22 years prior of the monastery at Segovia, and in October 1483 was made by Sixtus IV. inquisitor-general for Castile and Leon. The Inquisition (q.v.) had been established in 1480 at Seville, but Torquemada was the first to give it its organization. He founded four tribunals at Seville, Cordova, Jaen, and Villa Real. His name has become unjustly notorious as a cruel and barbarous inquisitor, though in truth he administered his office with no greater severity than was customary in his age in all the countries of Christendom, throughout which judicial torture was the common practice. Consult standard works on the history of Spain and of the Inquisition; also Molènes, 'Document Inédits. Torquemada et l'Inquisition' (1897).

Torre del Greco, tŏr'rĕ dĕl grā'kō, Italy, on the Bay of Naples, seven miles southeast of Naples, at the foot of Vesuvius. The town has been demolished by earthquake at various epochs, and in 1857 by a similar disaster was greatly changed and damaged. It is much frequented by foreigners as well as Italians on account of its sea-bathing. There are important coral and other fisheries. Pop. (1901) 33,299.

Tor'rence, Frederic Ridgely, American poet: b. Xenia, Ohio, 27 Nov. 1875. He was educated at Miami (Ohio) and Princeton Universities, was librarian in the Astor Library 1897–1901, and since 1901 at the Lenox Library, New York. He has published 'The House of a Hundred Lights' (1900); 'El Dorado: a Tragedy' (1903).

Torrens, tŏr'ĕnz, **William Erskine,** American promoter: b. New York 15 July 1870. After making a special study in the mills of New England and Philadelphia of manufacturing methods and finance, he became in 1896 foreign commissioner for the National Association of Manufacturers of the United States, and was thus engaged until 1899. During this time he secured concessions from Brazil, Venezuela, Argentina, Cape Colony, China, and Japan for establishing sample warehouses for the exhibition of American manufactured goods. He has written: 'Commercial Traveling in South America' (1897); 'Commercial Traveling in South Africa' (1898); 'Commercial Traveling in the East' (1899).

Torrens, Lake, South Australia, a large shallow salt lake, 125 miles long and 25 miles wide, about 90 miles north of Spencer's Gulf. In the dry reason it is reduced to a salt marsh.

Torrens Land System, a system of title-registration devised by Sir Robert Torrens, and first successfully used in Australia. Its object is to make the transfer of landed property as simple and as safe as that of any other property and to do away with the necessity of repeated title examinations. The system is operated through a bureau of registration, in charge of a registrar, and becomes effective on the first transfer of any property after the establishment of the system, all land transactions being registered in this office. A title may be registered as absolute or as possessory. Before registry the title is fully investigated by the registrar, who receives from the owner all the documentary evidences of title, descriptions of boundaries, etc. When the registrar is satisfied that the title is perfect, he files away all these old papers and issues to the holder a certificate of ownership, a duplicate of which is filed in the registrar's office. Such certificates bear on their faces notice of all incumbrances on the property. If the estate is vested in fee simple the title is known as "absolute" and the certificate is stated to be an absolute certificate. Should it appear that an absolute title to any land can be held only for a limited period or subject to reversions, then the registrar will except from the effect of registration any estate right or interest arising before the specified date or under the conditions named, all of which will be entered in the register and noted on the certificate, which is stated to be a "qualified" certificate. In the case of a "possessory" title the applicant is registered as becoming owner on giving such evidence of title as may be prescribed, and the registration of any person as first owner with a possessory title only will not interfere with the enforcement of any estate right or interest adverse to the title that may then exist or which may arise at a later date. And this fact is noted on the "possessory" certificate issued to the owner. This examination and registration of title does not have to be repeated after a certificate has once been issued, the transfer of the certificate with accompanying entry of that fact in the registrar's office completes the transaction. By this method the transfer of a land title certificate becomes as simple and as inexpensive as the transfer of a certificate of stock or of a bank share, and the holder of the title is absolutely free from the usual danger of land title transfers, such as flaws in the title, the neglect of obscure future conditions, etc. Should any person suffer loss through misdescription, omission, or any other error in the certificate issued by the registrar, he is indemnified from an insurance fund created for that purpose. This fund is provided by the imposition of a tax of one fourth of one per cent on the value of the land at the time of the first certificate of title being granted, in addition to the registration fees. The registrar is the judge in all cases as to the liability of the fund to such compensation. The fees for registration under the Torrens system are very small, usually being $24.00 in case of the first registration, and $3.00 upon the issue of every subsequent certificate.

The Torrens system is in use in Australia, Tasmania, New Zealand, British Columbia, Ontario, many parts of continental Europe and in Massachusetts, Illinois and Minnesota in the United States. Since the original Torrens Act gave a judicial and discretionary power to the registrar not in conformity with the spirit of American institutions, this portion of the law has been slightly changed in order to adapt it to the requirements of the latter country.

Torres (tŏr'rĕs) **Strait,** the narrow channel which separates Australia and Papua. From Cape York on the northern coast of Australia to New Guinea it measures about 80 miles. Navigation is unsafe owing to the shoals, islands and reefs within its waters. It was discovered in 1606 by a Spanish navigator from Peru.

Torres Vedras, tŏr'rĕs vā'drās, Portugal, a town in the district of Lisbon, situated on the railroad, 20 miles north of Lisbon. It is noted for its extensive lines of fortifications, 28 miles long, and reaching to the Tagus River. They were begun in 1809, and behind them Wellington in 1810 checked the French advance toward Lisbon. Pop. (1900) 6,891.

Torrey, Bradford, American naturalist and author: b. Weymouth, Mass., 9 Oct. 1843. He was educated in the public schools, taught two years, entered business in Boston, and from 1886 has been a member of the editorial staff of the 'Youth's Companion.' He has been well ranked as a field ornithologist, and writes entertainingly of his observations. His essays have been collected into the following volumes: 'Birds in the Bush' (1885); 'The Foot-Path Way' (1892); 'A Florida Sketch-Book' (1894); 'Spring Notes from Tennessee'; 'A World of Green Hills' (1898); 'Every-Day Birds' (1900); and 'Footing It in Franconia' (1900).

Torrey, Charles Turner, American anti-slavery reformer: b. Scituate, Mass., 21 Nov. 1813; d. Baltimore, Md., 9 May 1846. He was graduated at Yale in 1830, entered the Congregational ministry, and held pastorates at Princeton, N. J., and Salem, Mass. Having removed to Maryland to promote the cause of anti-slavery, he became an active agent of the Underground Railroad (q.v.), and was arrested and imprisoned in 1843 for his report of a slaveholders' convention held in Baltimore. The following year he was again arrested, and being convicted of aiding in the escape of runaway slaves, he was sentenced to a long term in the penitentiary. The harsh treatment he received while undergoing his sentence brought on consumption from which he died, and his remains were taken to Boston where he was honored by a public funeral. He was regarded as a martyr in the cause of abolition, and "Torrey's blood crieth out," became an anti-slavery watchword. He wrote 'A Memoir of William R. Saxton' (1838), and while in prison produced a volume of sketches of Massachusetts life, 'Stone, or the Pilgrim's Faith Revived' (1846). Consult: Lovejoy, 'Memoir of the Martyr Torrey' (1847).

Torrey, John, American botanist: b. New York 15 Aug. 1796; d. there 10 March 1873. He received his first instruction in botany, mineralogy, and chemistry from Amos Eaton, and was graduated at the New York College of Physicians and Surgeons in 1818. His leisure from medical

practice he devoted to scientific pursuits, particularly to botany, and in 1824 he abandoned medicine and became professor of chemistry, mineralogy, and geology at West Point. From 1827 to 1855 he was professor of chemistry and botany at the College of Physicians and Surgeons, serving simultaneously terms as professor of chemistry at Princeton, 1830–54, and of chemistry, mineralogy, and botany at the University of the City of New York, 1832–3. From 1853 until his death he was chief assayer in the United States Assay Office, New York. He participated in the councils of Columbia College as trustee, and in 1860 presented to that institution his extensive herbarium and botanical library. In his special field of scientific research his publications were numerous. One of his earliest was a 'Catalogue of Plants Growing Spontaneously Within Thirty Miles of the City of New York' (1819), which he prepared for the New York Lyceum of Natural History, of which he was a founder and for many years president. This body has since developed into the New York Academy of Science. In 1824 he began the publication of 'A Flora of the Northern and Middle States,' but he did not carry the work far owing to the fact that the Jussieu system of classification was coming generally to supplant that of Linnæus, upon which the work was planned. In 1843, as botanist of the Geological Survey of New York, he published an elaborate work on the flora of that State. Meantime he had issued in connection with Asa Gray (q.v.), parts of a work on 'The Flora of North America'; but this was also discontinued after the completion of the order *Compositæ*. Another work in association with Gray, also uncompleted, was a report on the botanical collections made by the Wilkes exploring expeditions. From 1845 onward he published memoirs and reports on the botanical specimens brought back by expeditions to various parts of the West and South by Capt. John C. Frémont and others, among them being reports on the botany of the expeditions for ascertaining the most practicable route for a Pacific railroad and making the Mexican boundary survey. He was president of the American Association for the Advancement of Science in 1855, and was named by Congress in 1863 one of the original members of the National Academy of Sciences.

Torrey, Joseph, American clergyman: b. Rowley, Mass., 2 Feb. 1797; d. Burlington, Vt., 26 Nov. 1867. He was graduated at Dartmouth in 1816 and at Andover Theological Seminary in 1819. He was for a time pastor of a Congregational church at Royalton, Vt., but in 1827 became professor of Greek and Latin at the University of Vermont. In 1842 he took the chair of philosophy there, and in 1862–6 was president of the institution. He translated Neander's 'General History of the Christian Religion and Church' (1854), and edited 'Remains of President James Marsh' (1843) and 'Select Sermons of President Worthington Smith' (1861). A volume of his lectures, 'A Theory of Fine Art,' appeared posthumously (1874).

Torrey Botanical Club, a botanical society in New York which is the most important organization of its kind in America, and one of the six scientific societies affiliated in the Scientific Alliance. The club was an outgrowth of a former club, chartered in 1871, although the first 'Bulletin' was published a year before. This earlier organization arose from previous informal meetings of a group of botanical collectors, who gathered as early as 1858, for field-work on the local flora. This band met in the herbarium of Columbia College, "drawn there by the genial welcome and wide botanical knowledge of its presiding spirit, Dr. [John] Torrey," and was the nucleus of the present club, finally organized under its present name, complimentary to Dr. Torrey, in 1873. Dr. Torrey was the first president, but unfortunately, died almost immediately.

The Torrey Club is the centre of botanical interest in New York, and the neighborhood, and is especially valuable for its weekly excursions that may be joined by any botanist, and which take parties out to good botanizing localities under intelligent guidance. Many local floras have been compiled by members of the club, one of the most important of which is that of Dr. Britton and others, 'The Preliminary Catalogue of Anthophyta and Pteridophyta growing within 100 miles of New York.' The valuable herbarium of the club includes the material for this list, and specimens of the flora, within the same area. It is now deposited at the New York Botanical Garden, which was originated and developed by members of this society. The club issues three regular publications, namely: 'Bulletin,' a very scientific and widely known journal; 'Torreya,' of more popular scope; and 'Memoirs,' which include many valuable monographs. The membership of the club in 1903 was 342, with 196 active members.

Torricelli, tŏr-rē-chĕl'lē, **Evangelista,** Italian mathematician and scientist: b. Faenza, Italy, 1608; d. Florence October 1647. He early devoted himself to mathematical studies, and having read Galileo's 'Dialogues,' composed a treatise concerning motion according to his principles. Galileo having seen this conceived a high opinion of the author, and engaged him as his amanuensis. He accordingly went to Florence in October 1641, but Galileo dying three months after, Torricelli was about to return to Rome, when the grand duke of Tuscany, Ferdinand II., engaged him to continue at Florence, giving him the title of ducal mathematician and the promise of a professorship in the university on the first vacancy. Torricelli's name is important in the history of science as the discoverer of the natural law according to which fluids rise in an exhausted tube from an open vessel exposed to the pressure of the atmosphere, namely, that the weight of the fluid which rises in the tube is equal to the weight of an equal surface of atmospheric air of the height of the atmosphere. See BAROMETER.

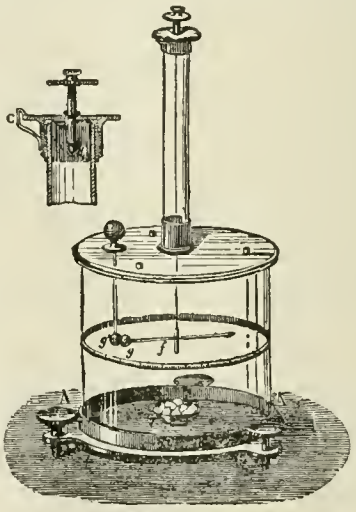
Torricellian Experiment, The, so called because made by the Italian physicist, Evangelista Torricelli (q.v.), who discovered the principle upon which barometers are made. Torricelli was led to investigate Galileo's theories of the law that "nature abhors a vacuum." He filled a glass tube, closed at one end, with mercury, and placing his finger over the open end inverted the tube. He now placed the tube vertically in a small trough containing mercury and removed his thumb from the open end, after it was under the surface of the mercury. The mercury in the tube dropped until it stood at a height of about 30 inches. Here it rested, with a vacuum in the top of the tube, under the closed

end. Torricelli concluded that the column of mercury in the tube was sustained by the pressure of the atmosphere on the larger surface of the mercury in the trough and that the height of the column was in inverse ratio to its specific gravity. Other experiments confirmed this theory and led to the invention of the barometer (q.v.).

Torrigiano, Pietro, pē-ā'trō tŏr-rē-jä'nō, Italian sculptor: b. 1470; d. Spain 1522. He went to England in 1509 to erect the tomb of Henry VII. and his queen, still in Westminster Abbey. The works which he executed for English churches were destroyed by the Puritans.

Torrington, tŏr'ĭng-tŏn, Conn., borough in Litchfield County; on the Naugatuck River, and on the New York, New Haven & Hartford railroad; about 23 miles west of Hartford and 18 miles north of Waterbury. Settlements were made in the vicinity in the early part of the 18th century, and in 1740 Torrington was incorporated. In 1887 it was chartered as a borough. It is the birthplace of John Brown (q.v.). The borough has a number of manufacturing establishments; chief among which are bicycle and machine shops, plating-works, brass-works, woolen mills, and novelty works. It also manufactures needles, hardware, and tobacco products. The number of manufacturing establishments, in 1900 (government census), was 108; the amount of capital invested in manufactories, $6,544,511; the number of employees, 3,522; the average annual wages, $1,704,291; the cost of the material used in one year, $6,687,684; and the annual value of the products, $10,017,121. The principal public buildings are the churches, schools, and the Y. M. C. A. building. The educational institutions are a high school, public and parish schools, several private schools, and a public library. There are two banks. The borough is the commercial and industrial centre of the town of Torrington, which contains 12,453 inhabitants. Pop. of the borough (1890) 4,283; (1900) 8,360.

Torsion Balance, an instrument in which small forces are measured by noting the torsion that they can produce in a fine wire, or a delicate fibre of some other material. The invention of the instrument is usually ascribed to Coulomb (1736–1806), who employed it in his extensive researches on electricity. Cavendish also made use of it for the purpose of determining the mass of the earth; his experiment consisting in determining the attractive power of a pair of leaden spheres, and comparing this with the attractive power of the earth itself. In its conventional form, the torsion balance consists of a light horizontal arm, suspended at the centre by the fibre whose torsion is to measure the force that is applied to the arm. Quartz is now used very generally for the suspending fibre, its employment having been suggested by C. V. Boys, who showed how to prepare fibres of this material, which are very strong and elastic. Boys dipped an arrow into melted quartz, and then shot the arrow from a bow; the quartz being thereby drawn out into a fibre of exceeding fineness. The upper end of the torsion fibre is attached to a graduated head, by whose rotation the fibre can be twisted through a known angle. In applying the torsion balance to the measurement of electrical repulsions, the horizontal arm, *f*, is provided at one end with a light ball, *g*, which can be charged to a definite electrical potential, and the torsion head is turned so that this ball is brought to a known distance from a similar fixed ball, *g'*, which can also be charged. The reading of the graduated head being observed when the fibre is free from torsion and the balls, *g g'*, are at a known distance from each other, the balls are charged. They at once separate, owing to the repulsive action exerted between two electrical charges of the same sign. The graduated head is then turned so as to produce a torsion on the suspending fibre, tending to restore the balls to their original position. The twisting of the head is continued until the relation of the balls is the same as at first; and when this state is established, it is evident that the torsion of the fibre is exactly balanced by the repulsion of the charges. In order to deduce the electrical repulsion in definite measure, it is only necessary to determine, by a separate experiment, what force is required to twist the suspending fibre through



Torsion Balance.

one entire turn; and a simple proportion then gives the repulsive force desired. The application of the torsion balance to experimental work of other kinds will be readily understood from the foregoing description of its application to the measurement of electrical repulsions; for the principles involved are the same in all cases, the force that is to be measured being determined by noting the torsion required to neutralize it, in a fibre whose torsional constant has been determined by direct comparison with a known force. The fact that the torsional moment of a homogeneous twisted fibre is proportional to the angle through which the fibre is twisted was established experimentally by Coulomb. In actual service, the torsion balance is surrounded by a case of metal or glass, the air in which is kept dry by a dish containing calcium chloride, or phosphorus pentoxid, or pumice stone wetted with concentrated sulphuric acid, or some other powerful and non-volatile drying agent.

The name "torsion balance" has also been applied to a form of commercial balance, in which the pans that contain the weights and the objects to be weighed are supported, not upon

knife edges, but upon the middle points of narrow, thin, horizontal ribbons of stretched steel, in such a manner that when the balance descends at either end, the steel ribbons are exposed to a torsional moment which tends to restore the balance to the normal position of equilibrium.

A. D. Risteen, Ph.D.,
Editorial Staff, 'Encyclopedia Americana.'

Torsional Rigidity, that species of rigidity by which a cylindrical bar of any material resists the action of a force (or "couple") which tends to twist the bar in such a manner as to convert its originally straight, longitudinal elements (or fibres) into a helical form. The torsional rigidities of a pair of cylindrical bars of identical dimensions but composed of different substances may be compared by comparing the twisting moments that are necessary in order to twist both of them through the same small angle. If one end of such a cylindrical bar is held fixed, while the other end is twisted by a lever applied to it after the manner of a wrench, the angle, x, through which the bar will be twisted, is given the formula $x = \frac{CLPR}{D^4}$; L being the length of the bar that is twisted, D being its diameter, and C being a constant peculiar to the material of which the bar is composed; while P and R are respectively the twisting force, and the length of the lever to the end of which this force is applied. The minimum diameter that a shaft should have, in order to transmit a given horse-power safely, may be calculated by the following formula: $D = F \sqrt[3]{H/R}$, where D is the diameter of the shaft in inches, H is the number of horse-power to be transmitted, R is the number of revolutions of the shaft per minute, and F is a numerical factor peculiar to each kind of material. For wrought iron, F may be taken as about 4, and for steel it may be taken as 3.8. Consult, Kent, 'Mechanical Engineer's Pocket Book'; Rankine, 'Applied Mechanics.'

Torsk, a Scandinavian species of cod. See Cusk.

Tor'so, an art term applied to the trunk of a statue of which the head and limbs are wanting, or to the trunk of a statue considered independently of the head and extremities. Many examples of ancient sculpture recovered in the last five centuries have been incomplete in this manner. The most famous is the Torso Belvedere, a torso of a statue of Hercules, seated. It derives its name from the Belvedere, at Rome, in the Vatican Palace where it is preserved, and is attributed to the school of Lysippus, being believed by some authorities to be the work of that master, although a Greek inscription ascribes it to the artist Apollonius. It is considered by connoisseurs one of the finest works of art remaining from antiquity.

Torstensson, tŏr'stĕn-sŏn, Lennart, Swedish general: b. Torstena, 17 Aug. 1603; d. Stockholm 7 April 1657. At 14 he became a page at the court of Gustavus Adolphus, and in 1630 accompanied him to Germany as captain of the bodyguard. He was commander of artillery at the battle of the Lech, 5 April 1632, was taken prisoner before Nuremberg in August and confined for six months in a subterranean dungeon in Ingolstadt. In 1641 he was appointed commander-in-chief of the Swedish army in Germany. He defeated the Archduke Leopold and Piccolomini at Breitenfeld, 2 Nov. 1642, threatened Prague and relieved Olmütz in 1643, and after the declaration of war by Denmark in December he advanced into that country and in six weeks had conquered the whole peninsula with the exception of the fortresses Rendsburg and Glückstadt. He defeated the Austrian general, Gallas, at Jüterbok, 4 Nov. 1644, and Katzfeld at Jankau 6 March 1645, pushed through Moravia to the Danube and destroyed the fortifications on Wolfsbrücke before Vienna. His siege of Brünn was unsuccessful owing to the stubborn defense and a pestilence among his troops, and after withdrawing into Bohemia, in 1646, he was compelled by illness to resign his command. He was made Count of Ortaba and governor-general of West Gothland by Queen Christina in 1647.

Tort is a legal term indicating an injury or wrong; a tort may be committed with force, as trespass which may be an injury to the person, such as assault or false imprisonment or to property in possession, or a tort may be committed without force, such as an injury to one's character or affecting one's personal liberty. One may be liable in damages for a tort, but same is distinguished from a similar right growing out of a contractural relation; a tort is also to be distinguished from a crime.

Torticol'lis, twisted neck, an affection in which, while the head is bent usually toward one of the shoulders, the twisting of the neck turns the chin to the opposite side. In this condition, known in various forms as stiff-neck or wryneck, lateral movement of the head often causes great pain, especially when the affection is due to rheumatism (q.v.). This attacks the muscles lying on the side of the neck, especially the sternomastoid. In the great majority of cases only one side of the neck is affected, the head being drawn more or less obliquely toward that side; but occasionally, in a form more strictly to be regarded as stiff-neck, both sides are equally attacked, in which case the head is kept stiffly erect and looking straight forward. As long as the head is allowed to remain at rest there is merely a feeling of discomfort; but every movement is apt to be extremely painful. This affection is usually caused either by exposure of the part affected to a current of cold air, or by wearing wet or damp clothes round the neck, but may also arise from spasm or strain of the muscles of the neck, causing a crick. It is usually temporary, but in some cases muscular contraction renders it permanent.

Tortoise. See Box-turtle; Land-tortoise; Terrapin; Turtles.

Tortoise Plant, a lofty climber of southern Africa, resembling a yam, and belonging to the same family. It has slender twining stems, alternate, netted-veined leaves, small dicœcious bell-shaped yellowish flowers in axillary racemes, and triple-winged capsules. It is, however, characterized by its globular rootstock, sometimes four feet in diameter, and growing above the ground. This enormous tuberous structure is woody or succulent, and is covered with a soft corky bark, which, cracking by exposure, becomes tessellated with angular protuberant plates suggestive of those of the tortoise. When young

it has also suggested the name of elephant's-foot, and its utilization as a food by the natives has given rise to the title Hottentot's-bread.

Tortoise-shell, the material of the large epidermal scales of the hawksbill sea-turtle (*Chelone imbricata*). Thirteen of these plates cover the carapace, and instead of being joined together by their edges so as to make apparently one piece, are thinned off at their posterior margins, and overlap each other like the tiles of a roof. They vary in size according to the part of the shield they occupy. The larger are sometimes from a foot to 18 inches long, by 6 inches broad; the thickness rarely exceeds the eighth of an inch. The beautiful mottled color and semi-transparent characters of this material are well known. A remarkable quality is possessed by tortoise-shell which very greatly increases its usefulness for the ornamental purposes to which it is generally applied, that is, the property of being easily softened by a heat equal to boiling water, and of retaining any form when cold which has been given to it when heated. Pieces can also be welded together by the pressure of hot irons properly applied. The chief use of tortoise-shell is in making combs for the hair; but it is also used for inlaying ornamental furniture and various other fancy objects. By the French cabinet-maker Boule (see BUHL-WORK) it was used most effectively in combination with brass as a veneer for rich furniture, and all boule or "buhl" work consists of such a veneering combination. In India, China, and Japan many articles are made of it, showing great skill and taste.

Tortoise-shell Butterfly, a butterfly of the genus *Vanessa,* as the Camberwell beauty (q.v.), in reference to the reddish-brown, black and white coloration.

Tortola, tôr-tō'la, one of the Virgin Islands, West Indies, belonging to Great Britain, lying northeast of the island of Saint John, from which it is separated by a narrow channel; area, 24 square miles. It is hilly and rugged, the highest elevation being 1,600 feet. Only a small part of the land is cultivated, sugar and cotton are raised, and sugar, molasses and rum exported. The island is the most important of the British islands of the Virgin group and contains the chief town, Roadtown.

Tortosa, tôr-tō'sä, Spain, a city in Catalonia, 48 miles southwest of Tarragona, on the Ebro River. Its ports are El Fangar and Los Alfaques at the mouth of the river. It occupies an acclivity rising from the left bank, and is fortified, part of the walls being of great antiquity. There are several small squares, and the streets are narrow and crooked, some of them very steep. The houses are built of solid masonry, there is a cathedral and other churches and a monastery; manufactures of soap, paper, hats, leather, porcelain, faience, and some trade. In the vicinity are fragments of Roman ruins, also marble and alabaster quarries. Pop. (1897) 23,302.

Tortric'idæ, a family of moths. See LEAF-ROLLER; MOTH.

Tortugas, tôr-too'gaz. See DRY TORTUGAS.

Torture, as a means of judicial punishment, descended to the countries of modern Europe from the Greeks, since it appears not to have been practised by the Hindus, the Hebrews, or the Egyptians. Torture was judicially inflicted either to extort confession, purge sin, or aggravate punishment. As practised by the Greeks, it was not applicable to a freedman, except in certain cases, but was commonly applied to slaves. Indeed the word of a slave could not be admitted as testimony, except under torture, and either party to a controversy could demand the torture of his opponent's slaves. The principal modes of torture with the Greeks were the wheel, the rack, the sharp comb, the burning tiles, the vault (into which the victim was bent double), and the injection of vinegar into the nostrils. From the Greeks the Romans got their system of torture and from the Roman laws it was engrafted in the judicial systems of all the modern countries of Europe. The Romans, like the Greeks, exempted freedmen from the horrors of torture, and under the republic this exemption was never violated. But under the emperors the torture of a freedman was not an infrequent occurrence. The Romans chiefly employed the rack, the scourge, hooks for tearing the flesh, and fire in its various uses. Roman contact with barbarian races gave the practice to the latter, but with one exception it made slow headway in replacing the older and more superstitious custom of the ordeal. That exception is in the case of the Visigoths who established a system of torture that remained uninterrupted from the time of their settlement in Spain to modern times, and which furnished a model upon which most of the other European systems were based. Legalized torture became common in France during the first part of the 13th century and in Germany a century later. English lawyers assert that it was never legalized in Great Britain, but certain it is that it was commonly practised, and, if not directly enjoined was at least sanctioned by the laws of that realm. All Europe came under the system during the 15th century, in consequence of the systematization of the Inquisition (q.v.), and the growth of that institution in power and importance, and with the exceptions of Great Britain and Sweden, torture formed a recognized department of the jurisdiction of European nations until the end of the 18th century. During the time of the Inquisition torture was applied by the civil, not by the ecclesiastical, court, and the ecclesiastics present at the question were there simply as witnesses of the confession and not as agents, as popular fancy has pictured them. A confession extorted by torture was of no avail to the prosecution before an ecclesiastical tribunal, unless it was voluntarily confirmed three days afterward. From the 13th century on, the use of torture increased, until its extreme cruelty and the horror of its practice led to a revulsion of feeling and to its general abandonment in the latter half of the 18th century. In some countries, however, it continued to be officially recognized and sporadically employed until the early part of the 19th century. It was abolished in Saxony in 1783, in Russia in 1801, in Würtemberg and Bavaria 1806–7, in France in 1789 (although it was employed in 1814), in Hanover in 1819, and in Baden in 1831. Consult H. C. Lea's 'Superstition and Force' (1870); R. L. Pearsall's 'The Kiss of the Virgin,' etc. (1838); M. J. Sassen's 'Disputatio de abusu et usu torturæ' (1697); Parsons, 'Studies in Church History,' Vol. II. Art. Inquisition (1895).

Toru Dutt, tō'roo doot. See DUTT, TORU.

Tory, the name of a political party, used in Great Britain and other Anglo-Saxon countries, is said to have originally been applied to the Roman Catholic outlaws who lived in the bogs of Ireland during the reign of Charles II. The name became identified with the opponents of the bill excluding the Duke of York from the English succession (1679), and was thus intended to imply Roman Catholic sympathies on the part of the duke's adherents. It was transferred to the court party in English politics, their opponents being classed as Whigs. Since the clergy of the Church of England taught the doctrines of passive obedience and the divine right of kings, they also were known under the name of Tories. In modern English politics the successors of the Tory party are known as Conservatives, but the old term is not infrequently heard in Parliamentary debate. Political parties in British colonies at times followed closely the divisions and names in England, so that in Australia and New Zealand the conservative elements in the representative assemblies were known as Tories. In the American colonies the name was given to the adherents to the policy of the mother country, and during the Revolutionary War was applied to all persons suspected of British sympathies.

Tosti, Francesco Paolo, frän-chĕs'kō pä-ō'lō tŏs'tē, Italian composer: b. Ortona di Mare 7 April 1827. He was a pupil anl later teacher at the Conservatorio Reale, Naples, and in 1869 appeared as a concert singer at Rome. Shortly afterward he became vocal instructor at the court; removed to London in 1875; and in 1880 was appointed instructor to the royal family. He produced 'The Grand Duke' (opera, 1888); 'La prima donna' (opera, 1889); and many English and Italian songs. His 'Good-bye'; 'For Ever and For Ever'; 'That Day'; etc., have been widely popular.

Tos'tig (Tosti, Tostinus), West-Saxon warrior: d. 1066. In 1055 he was made earl of Northumbria, Northamptonshire, and Huntingdonshire, by Edward the Confessor. A stern ruler, he repressed feud and disorder by the exercise of a merciless justice (*patriam purgando talium cruciatu vel nece*), with no distinction of rank. In 1063 he joined his brother Harold in the invasion of Wales, but in 1064, for treacherous murder, was outlawed, while Morcar was chosen to the earldom (1065). He retired into exile in Flanders, in 1066 committed various depredations on the Isle of Wight, Lindesey, and the east coast, and subsequently joined Harold Hardrada, king of Norway, in an invasion of England. They landed in Yorkshire, but were entirely overthrown by Harold and his household troops at Stamford Bridge. Tostig figures in Tennyson's drama of 'Harold' (1877). Consult Green, 'The Conquest of England' (1884).

Tota'ra, or **Totarra,** a tree (*Podocarpus totara*), of New Zealand, of the yew family, excelled only by the kauri for general utility, and most abundant in the central part of North Island. It is from 60 to 80 feet in height, and has a fibrous brown bark, which is deeply furrowed and was used by the natives for roofing their huts. Its leaves are linear and of a greenish-brown color. The wood is reddish-brown, clear and straight in the grain, and does not warp or twist. It is largely used for furniture, cabinet-work, and house-building, but is particularly valuable for bridges, wharves and marine piling, as it is durable under the ground or water, and resists the attacks of teredos for a long time. The aborigines made canoes from the trunks of these trees. See PODOCARPUS.

Totem, a word which appears to have been applied originally to the animal or other thing held sacred by certain American Indians as the sign or symbol of the tribe, or of an individual Indian. The superstition is not confined to American Indians, and has its counterpart in the symbols of civilized nations. The American eagle, the lion of Great Britain, the thistle of Scotland, the rose of England, etc., and the arms of noble families are illustrations. The practice can be traced, indeed, throughout all history, among the greatest empires and the most savage tribes.

The totem superstition varies in its features in different countries. The members of the Emu clan of an Australian tribe believe themselves to be descended from the emu, and are regarded as forming a kind of blood-group in virtue of their common descent. No member is permitted to marry within the clan, and all the members are bound to support one another in times of necessity. No Emu clansman will knowingly kill or eat an emu. Among some savage peoples the dead totem is elaborately mourned and carefully buried. Besides clan totems there are sex totems and individual totems. The totem having an important bearing on a person's relations to his fellows, it is shown conspicuously, being often tattooed on the skin or otherwise. The importance of totemism in relation to the social and religious institutions of savage peoples was first pointed out by J. F. M'Lennan in 1868, and much fresh light has been shed on the subject by subsequent investigators, but no satisfactory explanation of this curious system has yet been advanced. Totemism exists also among many African peoples, and numerous instances of it are to be met with in Asia and Polynesia. See AFRICA; AUSTRALIA; INDIANS, AMERICAN.

Totem Pole, a pole used among North American Indians to exhibit the totem figures. The totem pole is composed principally of three half human, half animal figures, seated above one another and holding erect a pole, on the summit of which, for instance, is the totem. See TOTEM.

Totonicapam, tō-tō-nē-kä-päm', Guatemala, the capital of the department of the same name, situated 60 miles northwest of the city of Guatemala. It manufactures cloth, pottery and wooden implements. Pop., consisting almost entirely of Indians, 25,000.

Totten, tŏt'ĕn, Charles Adiel Lewis, American inventor and military instructor: b. New London, Conn., 3 Feb. 1851. He was graduated at West Point in 1873, and has been instructor in military science and tactics at the Amherst Agricultural College, at the Cathedral School, Saint Paul, N. Y., and at Yale University. He has patented improvements in high explosives, in collimating sights, and in signal-shells; besides a system of weights and measures and improvements in linear and other scales. He has patented a war game which he described in a publication entitled 'Strategos, the American War Game' (1880), and has also published 'Important Questions in Metrology' (1883). More

recently he has engaged in biblical investigations, and has issued 'Lost Israel Found in the Anglo-Saxons' (1890); and 'Joshua's Long Day and the Dial of Ahaz' (1891).

Totten, Joseph Gilbert, American military engineer: b. New Haven, Conn., 23 Aug. 1788; d. Washington, D. C., 22 April 1864. He was graduated from West Point in 1805, was engaged in a survey of Ohio and the western territories, and in 1806 resigned from the army. He re-entered the army in 1808, was reappointed 2d lieutenant of engineers and was in charge of the construction of Castle William and Fort Clinton in New York harbor until 1812. He was chief engineer in the army on the Niagara frontier during the War of 1812, was brevetted lieutenant-colonel in 1814, and after the war was engaged in the construction of coast defenses until 1838 when he was promoted lieutenant-colonel and chief engineer in the army, and shortly afterward became supervisor and inspector of the United States Military Academy. At the outbreak of the Mexican War he was placed in charge of the engineering operations and in recognition of his services in planning the siege of Vera Cruz was brevetted brigadier-general in 1847. He then resumed his duties at Washington, but was appointed one of the commissioners for arranging the terms of capitulation. He became brigadier-general in 1863 and in 1864 was brevetted major-general. He published: 'Essays on Hydraulics and Other Cements' (1842).

Tottenham, tŏt'ĕn-am, England, a town of Middlesex, forming a suburb of London, and situated north of the city limits. Among its most interesting buildings are an old church and Bruce Castle, an Elizabethan mansion formerly owned by Robert Bruce. Pop. (1901) 102,519.

Tot'tenville, formerly an incorporated village in Richmond County, N. Y.; since 1898 in New York city. See STATEN ISLAND.

Totuava. See BLUEFISH.

Toucan, too-kän' or too'kan, a family (*Rhamphastidæ*) of coccygomorphous birds somewhat resembling the hornbills, and distinguished by the great development of the bill, which is curved superiorly and bears a prominent keel and the cutting edges are frequently toothed. The outer walls of the bill are extremely thin, its interior is hollowed out into air-cells, and it is thus rendered comparatively light. The tongue is slender, and barbed along the sides. The toes are paired, two forward, two backward, and the tarsi scutellated, the wings rather short and the tail long, with 10 quills. The toucans are confined to tropical America, where about 5 genera and 60 species occur. They are birds of brilliant and striking plumage, and the bill and naked skin about the eyes partake of this brightness of hue. Most of the species are gregarious, spending most of their time in hopping actively about among the treetops and seldom flying far. The times of their greatest activity are the morning and evening, when the woods are filled with their loud harsh cries. While fruits are their chief food, insects and the eggs and young of birds are also eaten. They have a characteristic manner of throwing back the head and bolting their food. When sleeping the head and tail are turned toward each other and rest on the back. All of the species, so far as known, nest in holes in trees, the birds sometimes excavating a suitable place in a decayed stub. Only two white eggs are deposited.

The following are some examples of the species, many of which are familiar in the collections of zoological gardens. The toco toucan (*Rhamphastos toco*) is black with a black and orange bill, blue circumocular areas and white throat and rump. It is nearly two feet long and inhabits Argentina. A well-known relative is the ariel (*R. ariel*). The araçari (*Pteroglossus aracari*) is green with the head and throat black and the bill black and white. A related species (*P. beauharnaisi*) is dark green with the lower back crimson, the belly yellow and red, and the bill black, orange and white. Both of these are found chiefly in the forests of the Amazon Valley. A well-known species is *Selenidera spectabilis,* in which the sexes are unlike. The hill toucan (*Andigena bailloni*) of the lowlands of Brazil, has the head, neck and lower parts orange yellow.

Consult: Sclater, 'Catalogue Birds British Museum,' XIX. (London 1891); Bates, 'Naturalist on the River Amazon' (London 1863).

Toucey, tow'sĭ, **Isaac,** American jurist: b. Newtown, Conn., 5 Nov. 1796; d. Hartford, Conn., 30 July 1869. He received a private classical education, was admitted to the bar in 1818, and established a law practice at Hartford. He was State's attorney for Hartford County in 1822–5, served in Congress in 1835–9, and was again State's attorney in 1842–4. He was governor of Connecticut in 1846–7, and in 1848–9 was United States attorney-general. In 1850 he was elected to the State senate, and served in the United States Senate in 1852–7. He was appointed secretary of the navy by President Buchanan in 1857, and served until 1861. His conduct of naval affairs was severely criticized. He was accused of favoring the secession cause by scattering the best ships of the navy in distant seas. The charge was denied, though Toucey continued to be regarded as a sympathizer with the South.

Touch, the sense of feeling. See SENSES.

Touchstone, Lydian Stone, or **Basanite,** a velvet-black jasper, used on account of its hardness and the uniformity of its texture and color as a streak tablet for determining the relative amounts of baser metal and pure gold in alloys. The sample is rubbed on the stone and the color is then compared with a series of standards of known composition. The expert is able quite accurately to determine the fineness of the sample, the streak becoming redder as the proportion of copper increases, or yellower as the percentage of gold increases. This method of testing has been in vogue from the earliest times, the name Lydian Stone appearing as long ago as 450 B.C. Modern methods of assaying have now largely superseded the use of this stone.

Toulon-sur-Mer, too-lôn sür mãr, France, a fortified seaport town and naval arsenal, in the department of the Var, on the Mediterranean, 42 miles southeast of Marseilles. The port is separated from the roadstead by bomb-proof moles and comprises two parts: one, including the merchant shipping; the other, the dockyard, slip, arsenal, foundry, etc. The fortifications are very complete. The cathedral was founded in 1096. This the hôtel-de-ville and a capa-

cious theatre are the chief buildings. Louis XIV. gave Toulon its importance as a naval station, making the dockyards and arsenal the finest of France. Toulon first became famous as a stronghold in the 16th century. Here the English were defeated by the fleets of France and Spain (1744); and in 1793, Napoleon forced the English and Spaniards to evacuate the position — his first memorable victory, while commanding the French Republicans. Pop. (1901) 101,172.

Toulouse, too-looz, France, capital of the department of Haute-Garonne, 160 miles southeast of Bordeaux, on the Garonne. A fine bridge connects the town with the village of Saint Cyprien. It is a quaint old town, but very enterprising. The most remarkable buildings are the cathedral, church of Saint Sernin, Hôtel-de-Ville, museum and Palais-de-Justice. The Musée contains an almost unparalleled collection of objects d'arts, from the Gallo-Roman to the Renaissance period. There are several fine academies of art, science and literature (one claiming its origin to have been in the games of the troubadours of 1323, namely, *Société des Jeux Floraux*); professional and technical schools, a large public library of 60,000 volumes, an observatory and botanical garden. The manufactures include textiles, leather, cannon, steam-engines, tobacco, brandy, etc. The tribunal of the Inquisition was established at Toulouse. In modern history, the most important event was its defeat by the English, while in ignorance of Napoleon's abdication. Pop. (1901) 147,696.

Toulouse Goose. See GEESE.

Tour, Maurice Quentin de la, mō-rēs kŏn-tăn dė lä toor, French painter: b. Saint Quentin 5 Sept. 1704; d. there 18 Feb. 1788. He began his art studies in his native town and subsequently devoted himself to the execution of pastel portraits in Paris, in which city he gained such reputation that the most famous of his contemporaries gave sittings to him. In 1746 he was elected to the Académie. He returned to his native town in 1784 and the Saint Quentin Museum now contains 80 portrait pastels of his. His 'Pompadour' is in the Louvre; and there are two other of his pictures in the Dresden Gallery. Consult: Patoux, 'L'Œuvre de M. Quentin de la Tour au Musée de Saint Quentin' (1886).

Tou'raco, a large and beautiful African bird of the genus *Corythaix;* with a short, rather small, high bill; both mandibles notched and finely serrated; short, rounded wings, with the three first quills graduated; a long rounded tail, short, strong feet and an erectile crest. Their prevailing color is green, with purple on the wings and the tail, the peculiar red of which is furnished by a special pigment called turacin. They feed on fruits, perch on the highest branches of trees. It is a member of the family of plantain-eaters (q.v.). Consult Newton, 'Dictionary of Birds' (New York 1896).

Touraine, too-rān, a former province and duchy of France, bounded by Maine, Orleannais, Berry, Poitou and Anjou. Its capital was Tours. It now forms the department of Indre-et-Loire. It was anciently inhabited by the Gallic tribe of Turones.

Tourcoing, toor-kwăn, France, a town in the department of the Nord, nine miles northeast of Lille. It is a well-built and prosperous manufacturing town with modern churches and schools, also a handsome hôtel-de-ville in Renaissance style. It has improved rapidly in a commercial sense, and the staple manufactures are the textiles of all kinds; besides dye-works, soap-works and sugar refineries. The manufacture of velvet carpets has extended especially. The chief imports are wool, flax, yarn and hemp. Exports combed wool, yarn, tissues, rags and flax. Pop. (1901) 78,233.

Tourgee, toor-zhā', Albion Winegar, American jurist and author: b. Williamsfield, Ashtabula County, Ohio, 2 May 1838; d. Bordeaux, France, 21 May 1905. He was graduated at the University of Rochester (N. Y.), enlisted May 1861 as a private in the 27th New York volunteers, was wounded at the first battle of Bull Run, and having been discharged, studied law and was admitted to the bar at Painesville, Ohio. In 1862 he re-entered the military service as 1st lieutenant in the 105th Ohio, in 1864 resigned, and in 1865 began professional practice at Greensboro, N. C. He was a delegate to the Southern Loyalist convention at Philadelphia in 1866, and in 1867 to the Constitutional convention of North Carolina, where he drafted the article on the judiciary. From 1868 to 1874 he was judge of the superior court of the State. During his term of office the Ku-Klux Klan was exposed and largely broken up, and his services to this end were very efficient. The sworn statements of several hundred members received by him were later utilized in a series of fictional works dealing with Reconstruction times in the South, of which 'A Fool's Errand' (1879) was the best known. Contemporary interest in these books was great, and their sales were very large for those days. Tourgee was made consul at Bordeaux in 1897, consul-general at Halifax in 1903, and from then until his death was again consul at Bordeaux. He was editor of 'The Continent' (1882–4; 5 vols.), an illustrated weekly published in New York (Vol. III. in Philadelphia). Among his other works were: 'Bricks without Straw' (1880); 'John Eax' (1882); 'An Appeal to Cæsar' (1884); 'Button's Inn' (1887); 'With Gauge and Swallow' (1889); 'Murvale Eastman' (1890); 'Out of the Sunset Sea' (1892); and 'The Mortgage on the Hip-roof House' (1896).

Tourjee, Eben, American musical conductor: b. Warwick, R. I., 1 June 1834; d. Boston, Mass., 12 April 1891. He studied at the academy at East Greenwich, R. I., and later opened a small music store in Fall River, Mass. Later he turned to music-teaching, both privately and in the public schools. After a period of study in Europe he opened a conservatory at Providence in 1864. This institution was removed to Boston in 1867 and became the New England Conservatory of Music which has grown to be the most important music institution of the kind in America. In 1872, when the College of Music of Boston University was founded, he became its dean. He was the organizer of several large choruses, notably that assembled for the Peace Jubilee in 1869, and another of nearly 20,000 singers for the World's Peace Jubilee in 1874.

Tour'maline, a common and widely distributed mineral, so called from an East Indian name, and known to earlier writers as schorl.

It is a very complex aluminum boro-silicate, with several marked varieties depending on the presence and proportions of other metallic oxides. The precise constitution of tourmaline has been recently studied elaborately by eminent mineralogical chemists both in Europe and America, without exact agreement, save in its general features, as derived from a complicated boro-silicic acid. According to the oxides present, three types are clearly determined, — iron tourmalines, mostly black; magnesia tourmalines, usually brown; and alkali tourmalines, in which some lithia is present, of red, green and other rich colors. These last, when transparent, yield beautiful gems, of a hardness of 7 to 7.5 and specific gravity 3 to 3.1. The black variety is quite common in schists, gneisses and granites; the brown is usually in crystalline limestones; the brightly colored varieties occur in dikes of albitic granite, often associated with lepidolite. The gem tourmalines have received a number of special names; the pink or red is called rubellite or Siberian ruby; the green, Brazilian emerald; the deep blue, indicolite, or Brazilian sapphire; the colorless, achroite. The crystals are rhombohedral, hemimorphic and of prismatic habit, either short and stout or long and slender, with three, six, nine or twelve sides, and with rhombohedral, or more rarely, simple basal terminations. The prisms are often so deeply striated vertically as to completely obliterate the faces. The physical properties of tourmaline are very interesting; it is rendered highly electric, both by heating and by friction, and it has remarkable polarizing action on light; so that plates cut from transparent crystals, parallel to their length, are much used in experiments in optics, mounted in the so-called tourmaline pincers or tongs. With this is connected a very high dichroism, such that the color is frequently quite different according as light traverses a crystal lengthwise or across. Entirely distinct from this is another peculiar feature, namely, the intermixture of two or more colors in the same crystal, either transversely (concentrically) or lengthwise, sometimes gradually and sometimes sharply; so much so that elegant gems have lately been cut from some of the crystals from Southern California which are half red and half green, with perfectly sharp demarcation between the two brilliant tints. The most noted localities for bright-colored tourmalines are in the Ural Mountains, the island of Elba; Brazil; Paris, Maine, Haddam Neck, Conn.; and above all, several mines recently opened in San Diego and Riverside counties, California. (See GEMS.) Superb black tourmalines occur at Pierrepont, N. Y.; fine brown crystals at Gouverneur, N. Y., and Hamburg, N. J.

Tournai, toor-nā, Belgium, a town in the province of Hainaut, on the Scheldt, 35 miles southwest of Brussels. It is the seat of a bishop, has pleasant suburbs, fine quays and streets. Its ancient Romanesque cathedral has five towers and contains pictures by Rubens. Other churches are St. Quentin, St. Brice, and St. Jacob, besides the belfry with its wonderful chimes. Other prominent features are a picture-gallery, a library of 60,000 volumes, an episcopal seminary, five hospitals, an asylum, museum of natural history, city-hall, theatre, and a bronze statue of Princess d'Epinoy, marble bust of Dumortier, and many mediæval buildings. The industries embrace the manufacture of woolen goods, hosiery, valuable carpets, linen, ribbon, faience, soap and candles, much of which is hand-work. Tournai was in the 5th century the seat of the Merovingian kings, then belonged to France, but later was incorporated in the Spanish Netherlands. Pop. (1900) 37,069.

Tour'nament, a friendly contest at arms among warriors of noble birth during the Middle Ages. The use of the term was not fixed and it denotes the gathering of the nobles and knights, the contests, and the fetes or carousals which followed. A tournament often lasted several days, a week, or even two, and during this time the lords and knights would gather at the town in which it was to be held, with their servant and esquires, and each would establish quarters which would be made gay with flags and pennants, and would erect his arms or insignia. Meantime there would be prepared the lists, the place where the contests were to be held; this consisted of a rectangular space of large dimensions, fenced in by ropes or a railing and surrounded by galleries erected for the ladies and spectators of honor. Certain qualifications of birth were necessary for admission to the contests, and each lord or knight had for sponsor some lady whose champion he claimed to be and whose colors he wore. The knights were attended by their squires who furnished them with arms, raised them if dismounted, etc. The weapons used in the contests were lances with the points covered, swords with point and edge dulled, and maces or clubs of wood. The knights wore armor which was heavy or light according to the customs of the section in which the contests took place; the latter were held under very exact rules and under the constant supervision of judges and governors. In some of the tourneys it was not allowed the contestant to dismount: he was to run so many courses with the lance or strike so many blows with the sword or mace, and the successful knights received prizes delivered by some lady who had been selected the queen of beauty. On the second day there was often a tourney for the esquires and perhaps on the third day there would be a general melée of knights or squires or even a small mock battle in the lists.

Such were the tournaments of the latter part of the Middle Ages. Their origin is obscure and they seem to have passed through a period in which they were contests in deadly combat and never a friendly contest for skill. It is thought they arose out of the old trials by ordeal (q.v.) and that at first they partook of a judicial nature. Certain it is that at first they were far more deadly than in later years and that they were not uncommonly fought with the weapons of war. Jousts differed from tournaments in two respects: they were single combats between two men, and they were oftenest fought with the weapons of war. Jousts were of two kinds — the *joûte à outrance,* or mortal combat, usually fought between two representatives of different nations; and the *joûte à plaisance,* the joust of peace which

sometimes took place at the end of a tournament, but which seems oftener to have been a pre-arranged contest in the nature of a duel. Later, while jousts still retained the aspect of a single combat to decide some question of importance, they lost their vicious nature and blood was rarely spilled. The passage of arms was a favorite practice of roving knights, a party of whom would assemble at some place and suspend, each, several shields of different colors, offering combat to any knight who presented himself. The acceptor of the challenge struck the shield of the knight whom he wished to engage and the color and variety of the shield which he struck determined the nature of the combat and the arms to be employed.

The tournament languished with the decline of chivalry, after the 15th century. The death of Henry II., who was accidentally killed in a tilting contest, had much to do with hastening its abolition, but it is probable that the change in the modes of warfare and the critical temper endangered by the revival of learning were more nearly the causes of their abandonment. Consult Léon Gauthier's 'La Chevalerie'; Hallam's 'Middle Ages'; and Viollet-le-Duc's 'Dictionnaire du Mobilier.'

Tour'niquet, an instrument for compressing a blood-vessel to stop the flow of blood in amputations and in dangerous hemorrhage from wounds, and to control the circulation through an aneurism. It is believed to have been first used in France by Morel (1674). As used by this surgeon in amputations of limbs, it consisted of a stick passed beneath a bandage and twisted so that the tight knot would exert especial pressure on the principal bleeding vessel, the rest of the bandage compressing the other vessels of the limb sufficiently. At the present time such a tourniquet is known as an emergency tourniquet, which may also consist of a bridle-rein, rope, piece of cloth (as the leg of a pair of trousers, or a coat-sleeve), etc., tied around the part above the wound in case of arterial hemorrhage (below, in case of venous hemorrhage), and twisted by means of a stick, bayonet, or the like. Compression is increased by placing a pad over the main artery. Compression of a bleeding vessel with the thumb or finger or a padded key or stick is of service where a tourniquet cannot be obtained. Tourniquets are of various kinds, and are named principally from their inventors. Du puytren's tourniquet consists of a semicircular piece of metal with a head at one end, and is used to compress the abdominal aorta; Esmarch's consists of a piece of flat rubber tubing to be wound about the upper part of a limb, after the blood has been driven out of the limb by an elastic bandage, or to be used by itself in compression of the iliac arteries, the abdominal aorta, etc. The field tourniquet, resembling Petit's spiral tourniquet, is a padded strap to be buckled on and pressed down by a screw upon an artery. With the horseshoe tourniquet, named from its shape, pressure is exerted at two points. The provisional tourniquet is one applied loosely, to be tightened in case of necessity.

Touro, too'rō, **Judah**, American philanthropist: b. Newport, R. I., 16 June 1775; d. New Orleans, La., 18 Jan. 1854. He was the son of Rev. Isaac Touro, who in 1762 was chosen rabbi of the Jewish congregation of Newport, R. I. The son removed to Boston, Mass., where he engaged in business with his uncle, Moses Hays, in whose employ he sailed to the Mediterranean in 1798 as supercargo. In 1802 he settled in New Orleans, where he became a wealthy merchant. He displayed his patriotism in the War of 1812 by enlisting as a volunteer in Gen. Jackson's army, and was severely wounded at the battle of New Orleans. The range of his benevolence was very broad; families and individuals, churches and synagogues alike were enriched by him. Toward the erection of the Bunker Hill Monument he gave $10,000.

Tours, toor, **Berthold**, Dutch composer: b. Rotterdam, Holland, 17 Dec. 1838; d. London 11 March 1897. He studied at Leipsic and Brussels and going to London in 1861 became musical editor to Novello, Ewer & Co., 1878. His productions were principally religious in character and his 'Service in F,' 'Blessing, Glory, Wisdom, and Thanks,' and 'O Saving Victim,' were especially favorites. As a church composer he represented, with Stainer and Barnby, a new phase of English Church music which comprehends the introduction of new dramatic and melodic elements for which the entire school is probably indebted to M. Gounod.

Tours, France, capital of the department of Indre-et-Loire, on the left bank of the Loire, at the confluence of the Cher, 120 miles south-southwest of Paris. The principal entrance to the city is by a magnificent bridge across the Loire, 1,423 feet long. The banks of the river are enclosed by a quay, lined with handsome houses and finely-planted promenades. Great part of the town is new, and many of the streets are spacious and elegant; but the older quarters are inferior. The principal edifice is the cathedral. Its west front consists of three lofty flamboyant portals surmounted by a window of astonishing dimensions, and flanked by two domed towers, 205 feet high. The interior, of the purest Gothic, and lighted by beautifully stained glass, is 256 feet in length and 85 feet in height. Two towers form conspicuous objects from every part of the town; one called the tower of St. Martin or Horloge, from containing the principal clock; the other the tower of Charlemagne, because his queen Luitgarde was buried below it; and both remarkable as the only relics which the revolutions of 1793 have left of the vast cathedral of St. Martin of Tours, after it had flourished for 12 centuries. The archiepiscopal palace is regarded as one of the most handsome in the kingdom. The manufactures consist of silk stuffs, ribbons, broad-cloth, serge, rugs, chemicals, and leather; and the trade is in corn, wine, brandy, dried fruits, wax, hemp, wool, etc. Tours early acquired considerable importance, and under the Romans was known by the name of Cæsarodunum. It was from the gates of Tours that Charles Martel (q.v.) drove back the Moslem

invasion of Europe in 732. In modern times it became famous for its silk manufactures, and had so extended as to have a population of 80,000, when the revocation of the Edict of Nantes deprived it of nearly half its inhabitants, and almost all its industry, and inflicted a blow on its prosperity from which it has never recovered. During the Franco-German war Tours was made the seat of the government delegation during the siege of Paris, 12 Sept. 1870. The delegation removed to Bordeaux on 10 December. Tours surrendered to the Germans on 21 December. Pop. (1901) 64,448.

Tourville, toor-vēl, **Anne Hilarion de Cotentin**, Count de, French naval officer: b. Tourville, department of La Manche, 24 Nov. 1642; d. Paris 28 May 1701. He entered the navy in 1660, became a captain in 1667, participated in the battle of Agosta in 1676, and in command of the vanguard at the battle of Palermo in 1677 he destroyed 12 of the enemy's ships. He was appointed lieutenant-general of marine in 1680, commanded several expeditions against the North African pirates in 1682–8, became vice-admiral in 1689, and in 1690 was in command of the fleet which supported James II. of England. He defeated a Dutch-English fleet off the Isle of Wight in that year, but in 1692 was ordered to attack a superior fleet off Cape La Hogue, in order to facilitate the landing of the Jacobites, and was defeated. He was created marshal of France in 1693, and in that year he captured and destroyed a Dutch-English fleet off Cape Saint Vincent. At the outbreak of the War of the Spanish Succession he was appointed commander-in-chief of the combined naval forces of France and Spain, but died shortly after.

Toussaint, too-săñ, **François Dominique**, called **L'Ouverture**, loo-vĕr-tür, Haitian soldier and liberator: b. 1743; d. Fort de Joux, near Besançon, France, 27 April 1803. He was a full-blooded negro, and was born a slave. When the insurrection of the blacks broke out in 1791 Toussaint took service in their army, but not till he had assisted his master to escape. He rose quickly in the army, being made in 1795 a general of brigade. In this position he displayed much military as well as political ability, and rendered valuable services to the French Republic against the British troops which had been landed on the island. In 1797 the French government made him general of division and subsequently general-in-chief of the troops in Santo Domingo, and as such he signed the convention with General Maitland for the evacuation of the island by the British. He now assumed sovereign authority, but it was only after a severe struggle against insurrectionary movements that he was able firmly to establish his position. In 1801, on the submission of the Spanish forts, he was completely master of the island. He now framed a constitution by which he was appointed president for life of the Republic of Haiti, with the right to name his successor. He was simple and abstemious in his own habits, but affected great magnificence in his surroundings, and exacted a rigorous court etiquette. By his vigorous government the commerce as well as the agriculture of the island began to revive. After the Peace of Amiens Napoleon sent a powerful expedition under his brother-in-law Leclerc to subdue Toussaint, who after a struggle was forced to surrender, and on his oath of fidelity was permitted to retire to his estate. He was afterward detected conspiring against the French, and being seized by a somewhat unworthy stratagem, was sent to France, where he died in prison. At the time a suspicion of poisoning was general, but there is no evidence to support it. Consult his 'Mémoires' (1853); the lives by Saint-Rémy (1850), Gragnon-Lacoste (1877), and Schœlcher (1889); and Wendell Phillips' lecture.

Towako'ni, a sub-tribe of the Wichitas, of the Caddoan linguistic stock of North American Indians, who in 1719 were found on the Cimarron, near its junction with the Arkansas, in the present Creek Nation, Indian Territory. Later they were on the Brazos and Trinity rivers of Texas and in 1822 were reported to number 1,200. They made their first treaty with the United States in 1837. In 1840 they were said to have numbered 500 and to have resided on the Pecan branch of the Colorado River of Texas, but by 1850 their population was reported at 140 and their home on the Upper Brazos. They are now with the Wichitas on a reservation in Oklahoma, where they number about 130.

Towanda, tō-wän'da, Pa., borough, county-seat of Bradford County; on the Susquehanna River, and on the Lehigh Valley Railroad; about 50 miles northwest of Scranton. It is in an agricultural and stock-raising region, and is the commercial and industrial centre for a large portion of the county. The chief industrial establishments are planing mills, furniture factories, wagon and carriage works, a large toy factory, a piano factory, foundries and machine shops. In 1900 (government census) Towanda had 89 manufactories, with an invested capital of $673,201; and the annual products were valued at $732,433. The water supply comes from springs 16 miles from the borough. The educational institutions are Susquehanna Collegiate Institute (Presbyterian), founded in 1850, a high school, public and parish schools, a high school library containing about 4,000 volumes, and a college library. The two national banks have a combined capital of $300,000. Pop. (1890) 4,169; (1900) 4,663.

Tower, Charlemagne, American diplomatist: b. Philadelphia 17 April 1848. He was graduated at Harvard in 1872, and spent four years in study and travel in Europe and the East, part of which time he was attaché to the American legation at Madrid under Daniel E. Sickels, minister to Spain. After his return he was admitted to the bar in 1878, and in 1882 removed to Duluth, Minn., where he was connected with large railroad and mining interests. In 1887 he settled in Philadelphia, and in 1891 relinquished active business affairs and gave his attention to historical studies. He became president of the department of archæology and palæontology at the University of Pennsylvania. In 1897 he was appointed United States minister to Austria-Hungary; during 1899–1902 he was ambassador to Russia; and in the latter year succeeded Andrew D. White as ambassador to Germany. He has published a 'Catalogue of a Collection of American Colonial Laws' (1890), and 'The Marquis de Lafayette in the American Revolution' (1895).

Tower, Zealous Bates, American soldier: b. Cohasset, Mass., 12 Jan. 1819; d. there 21 March 1900. He was graduated from West Point in 1841, and was appointed 2d lieutenant of engineers the same year. He was employed in the construction of the defenses of Hampton Roads in 1843–6, and served with distinction in the Mexican War. Promoted major in August, 1861, he fought in the first battle of Bull Run, and for bravery in the second battle of Bull Run was brevetted major-general. He became lieutenant-colonel in 1865, and colonel in 1874; and was retired in 1883.

Tower, in architecture, a structure lofty in proportion to its lateral dimensions, of varied form or plan, whether standing alone or forming a part of a church, castle or other building. In ancient times towers were erected as memorials to the dead, for purposes of defense and as religious monuments. Among towers are included the mosques of the Mohammedans, the lofty bell towers common in Russia, ancient lighthouses along the seacoasts, and the round towers of India, Ireland and other countries. The round towers were tall, slender structures, tapering gradually from the base upward to various heights. They were originally built for purposes of defense and were usually of stone. The tower bastion contained rooms and cells. (See Bastion.) Water towers are similar to stand pipes (q.v.). See also Gable for a description of gabled towers.

Tower and Sword, Order of. See Orders, Royal.

Tower Bridge, London. See Bridge: paragraph *Movable Bridges;* also London.

Tower of London. See London: *The Tower.*

Tower, Round, a building peculiar to early Christian architecture, of slender form, and usually bearing a conical roof. Windows are few in number and generally small. The type is common to Ireland, and in addition to the Irish bee-hive huts forms its only distinctive contribution to architecture (see Ireland, *Art and Architecture*). More than one hundred exist in Ireland. A few examples are to be found in Great Britain and on the Continent, pointing to the time of the invasion of the Irish missionaries. The smallness of the windows seems to make it improbable that the towers were used for bells and rather points to their employment for defensive purposes. The name is given to remains of structures of American Indians of the Pueblo type. They are found standing in isolation or in connection with walls of rectangular form. Some are interesting structurally for their two or three concentric walls, with the two outer ones connected by transverse walls on radial lines. They were built of roughly dressed stone and when found adjoining other structures are known as kivas.

Tower of Silence. This name is applied to structures built by the Parsees for the disposal of their dead. They are towers — called dakhmas — about 40 feet high, and with large diameter. Somewhat below the top of the wall is built a floor of iron grating and upon this the bodies of the dead are placed until by exposure to the elements and to birds of prey the flesh is entirely removed from the bones, and they have fallen into a pit below. From here the bones are removed to neighboring caverns. One of these "towers of silence" stands in the neighborhood of Bombay, India.

Tower of the Winds. See Athens.

Tow'hee Bunting, a large, black, white and chestnut bunting of the American genus *Pipilo,* several species of which occur in the United States. Several are confined to the southwest, but one species, the chewink, or ground-robin (*P. erythropthalmus*) is numerous in summer throughout the whole of the eastern half of the country, and its sharp, metallic call is familiar to every countryman. In spring the male has a delightful song, but one not frequently heard. The nest of the towhee is made upon the ground in the woods, where the birds spend most of their time, scratching vigorously among the leaves for their food; and its five red-spotted eggs are cleverly concealed by a domed canopy of twigs and leaves. Consult Wilson, Audubon and other writers on American birds.

Town and Town Meetings. In its broadest meaning the word town denotes simply a collection of houses without regard to the size of the collection and without regard to the form of its political organization. In this sense a hamlet without any governmental powers at all of its own may be referred to as a town and likewise a great municipality like New York or London may be thus designated. In some of the Southern and Western States "town" is the legal designation of a municipal corporation whose powers are greater than those of a village and smaller than those of a city. In the New England States, while the word town is often used in a loose or broad sense, more frequently a town denotes a minor civil division which is sometimes wholly rural, sometimes wholly urban, and sometimes partly rural and partly urban. A primary meeting of the voters of a New England town summoned for the consideration of local business is called a town meeting.

The Pilgrim Fathers who settled at Plymouth (1620) and the Puritans who settled (1628–30) at Salem and Boston began at once to develop a system of local government. They settled in compact communities and gave the name town to the thickly inhabited portion of a grant or purchase. The uninhabited land lying outside of the town, yet belonging to the grant, was at first called the township, but in time, as building was extended, the word town came to be used to denote the whole extent of the town's domain. The organization of the town was accomplished through the agency of a town meeting. The early settlers of New England were equals in social rank; their average of intelligence was high; they were nearly equal in worldly possessions. Respecting matters of government, they were intensely democratic and at the same time intensely theocratic. They believed that the state should be a "city of God" and that authority in spiritual and temporal matters should flow from a common source. Accordingly their town meetings were religious assemblages acting as pure democracies, except in Rhode Island, where the civil authority did not interfere in matters of conscience. The meetings

in colonies where the theocratic principle prevailed were usually held in a church, and all the male church members of the town who were of legal age could attend and take part in the discussions and vote upon any question that might arise. The town was incorporated and its boundaries were defined by the colonial legislature. It was then left to govern itself pretty much in its own way, providing, of course, it did nothing contrary to the laws of the colony. At first, while local government was getting under way, town meetings were called every month or two. In Boston in 1635 ten general town meetings were held. The people soon found, however, that they could not give so much time to public affairs, and it was not long before it became the custom to summon the town meeting but once in the year, provision being made for calling special meetings when there was need. The town meetings elected such officers as were required for the management of local business and made such by-laws (town laws) as commended themselves to the judgment of the community. For the management of the affairs of the town during the interval between town meetings a board of townsmen, usually called selectmen, was elected. The number of selectmen in the earlier towns ranged from three to thirteen. These officers administered the finances of the town, appointed sundry subordinate officials, let out contracts for public work, and exercised such powers as were necessary to secure and maintain the peace, safety, comfort, and religious conformity of the people. As stewards of the people they gave to the town meeting an account of their stewardship in the form of an annual report. A town clerk, who acted as secretary of the meeting and who served as the recording officer of the town, and a constable, whose duties, broadly speaking, were those of a peace officer, were always chosen. The selectmen, the clerk, and the constable were the constitutive officers; no town was without them. Among other officers elected in the town meeting may be mentioned the tithing-man, a kind of Sunday constable, who saw that the people came to church and with fox-tail wand kept them awake during the sermon; the fence-viewer, who supervised the erection of boundary fences between adjoining owners; the hog-reeve, who saw that rings were kept in the noses of swine running at large; the field-driver, who impounded stray cattle. Representatives to the colonial legislature were also elected in town meeting. Besides electing town officers, the town meeting acted as a legislature for all matters of local concern. It levied the town taxes; it passed by-laws relating to the use of common fields and pastures; it made assignments of lands to individuals; it provided for the management and support of the schools. In all New England colonies but Rhode Island it regulated and controlled all affairs connected with the church, subject to the superior authority of the colonial legislature. No detail of the civil or religious life of the community was too small for the attention of the town meeting. It prescribed the manner in which the schoolmaster should use the rod; it directed the arrangement of seats in the church; it specified the hour of the day at which the woodman should begin to wield his axe.

Such was the early New England town meeting. Its origin is traced by some students of political science to the Anglo-Saxon *tunscipe* and to the still earlier Teutonic mark. The early New England town certainly bore a strong resemblance to the ancient type of Teutonic local government. The name town itself reminds us of the Saxon tun (Old German *Zun*, a hedge); the selectman reminds us of the Saxon *gerefa*, headman (he was actually called "headman" in Rhode Island); the town meeting was, in many particulars, a counterpart of the Saxon Tunmoot. There is no evidence, however, that the New England settlers consciously imitated any existing or pre-existing type of local government when they developed their town system. They brought to their task English political instincts and English traditions and availed themselves of English experience, but the town as an institution, both in its organization and in its functions, was an outgrowth of the peculiar social, economic, and political conditions which prevailed in New England during the first years of the colonial period.

The town meeting system described above had its beginnings in the settlements of Plymouth, Salem, and Boston, and was adopted by the offshoots of these parent towns. Whenever the population of a grant or purchase became sufficiently large to support a church and conduct local government it was incorporated by the central legislative body and a town meeting was called. Thus the town system grew as New England grew and was soon deeply rooted in the affections of the people. It resulted in a society that was as purely democratic as any the world had ever seen. During the colonial period the town was the distinguishing feature of New England life, and when the Revolution came the little democracies proved to be powerful aids in the cause of liberty. In the town meeting it could easily be learned who were loyal and who were not. Through the agency of the town organization military stores were secured and the famous minute-men (q.v.) were organized. The resolutions of numerous town meetings voiced in the plainest manner possible the sentiment for independence and were the precursors of the Declaration itself. And their influence in great public affairs continued after the Revolution. "How powerfully," said Thomas Jefferson, "did we feel the energy of this organization [the town] in the case of the Embargo (q.v.). I felt the foundations of government shaken under my feet by the New England townships. There was not an individual in their States whose body was now thrown with all its momentum into action, and although the whole of the other States was known to be in favor of the measure, yet the organization of this selfish community enabled it to overrule the Union." In another place the great Democrat says: "They [New England towns] have proved themselves the wisest invention ever devised by the wit of man for the perfect exercise of self-government and for its preservation."

In its essential characteristics town government in New England has not changed greatly since the days of the early settlers, except in its religious feature; that feature entirely disappeared in the early part of the 19th century, when the separation of Church and State was achieved. Details in the organization and in the powers of the town differ in the different New England States, yet the outlines of town government in all these States are practically identical, and are as follows: The State legislature defines the boundaries of the town, incorporates it, and confers powers upon it. As a corporation, the town can sue and be sued, and can acquire and hold real property. A town may be divided by the legislature into two or more towns or can be united with and made a part of another town. The public affairs of the town are transacted in a town meeting which meets annually, and also assembles in special meetings which may be called from time to time. The meeting is held in the town hall or in some other hall sufficiently large to accommodate the mass of voters. When the people have assembled, the town clerk calls them to order and states the purposes for which the meeting is called. A moderator (presiding officer) is then chosen and business proceeds according to parliamentary rules. All questions are decided by a majority vote of the legally qualified voters in attendance. Usually citizens who are qualified to vote for a governor and for members of the State legislature are also qualified to vote in town meeting. Here is democracy in its purest form. Young and old, rich and poor, the obscure and the prominent, are present, and every citizen may not only vote, but, if he chooses to do so, may also bring the full force of his character and influence to bear upon the deliberations of the meetings. Routine business is quickly disposed of, but those matters which happen to be the subject of contention are generally discussed fully and freely. The right to vote on local taxation and appropriations is in some States reserved to taxpayers. The finances of the town are watched keenly, and if there has been mismanagement or extravagance during the past year there is sure to be a merciless exposure in the town meeting. If improvements are needed or if the town is lagging behind its neighbors in progressiveness, the discussion in the folkmoot is likely to be directed toward a remedy. At annual town meetings the following things are done: (1) The rate of taxation for the coming year is fixed. Money is appropriated for the schools, for the care of the roads, for the support of the poor, for the salaries of officers, and for other necessary expenses. Sometimes the schools are managed by school districts. When this is the case each district elects its own officers and sometimes also makes its own levy, but the town meeting or town council elects the school superintendent. (2) By-laws are passed. These may relate to such matters as infectious diseases, locations of sidewalks and curbstones, the erection of buildings, the regulation of the speed of vehicles. Many things which in other places are done by a body of chosen representatives are done in town meeting by the people themselves acting as legislators. (3) Town officers are elected. At the head of these stand the selectmen, or councilmen, three or five or seven in number. These are the executive officers of the town. They supervise the construction of roads, grant licenses, care for the poor, abate nuisances, check the spread of contagious diseases, listen to the complaints of those who have grievances of a public nature, select jurymen, canvass the voting list, and represent the town in court when it is sued. When a specified number of voters sign a call for a special town meeting it is the duty of the selectmen to place on the town post a warrant which calls the meeting and states the purposes for which it is called. After the selectmen, the town clerk is next in importance and usefulness. This officer calls the town meetings to order, and keeps a record of its proceedings. In addition, he usually keeps a record of the births, marriages, and deaths, and grants certificates of marriages, and the real estate records of the town. Town assessors make out a list of the taxpayers of the town and place an estimate upon the value of their property. Sometimes the selectmen themselves act as assessors. In addition to the officers mentioned, the town meeting usually elects tax collectors, a town treasurer, town solicitor, overseers of the poor, a school committee, trustees of the town library, constables (peace officers), surveyors of highways, fence-viewers, milk inspectors, and field-drivers, or it refers the election of these officials to the town council. All town officers have a tenure of one year. The list of officers which has been given is not complete, yet it is long enough to show that in every New England community a great many people must take a part in public affairs. Undoubtedly it is this general participation in the business of government that makes the people of this part of our Union such a wide-awake and progressive body of citizens.

In all the New England States (Massachusetts excepted) the town is the unit for representation in at least the lower branches of the State legislature. Government in New England is, therefore, by towns rather than by counties, as in other States. The town has so many functions and absorbs so much local business that little is left for the county to do. Indeed the county in New England exists principally for judicial purposes; in Rhode Island it exists solely for judicial purposes. As it is to-day so it has always been: throughout the whole period of her history the focus of New England life has been the town. "Towns," says Joel Parke, "have been the arterial system of New England through which has circulated the life-blood which has invigorated, sustained, and strengthened her, making her expand in her religious, social, educational, benevolent, and political institutions." The people cling tenaciously to their town system. Boston did not change from town to city government until 1820 when, with a voting population of 7,000, she found that the town meeting could no longer act as a deliberative body. Yet the conditions of population in recent years sometimes make it extremely difficult to administer local government on the town plan. People are mov-

ing from the country to the city, depleting some towns and making others too large to meet in mass. The smallest town in New England (census 1900) is Cambridge, N. H., with a population of 17; the two largest are Warwick, R. I., and Brookline, Mass., with a population of 21,316 and 19,985 respectively. It would seem that Cambridge is too small for a unit of government of any kind and that Warwick and Brookline are too large to act as pure democracies. As a matter of experience local government in New England is changing with the new conditions. So long as the population of a place remains below 10,000 (the population of Aristotle's ideal city) town government is usually economical, efficient, and pure, but when the population greatly exceeds that number the interest of the citizens in local matters begins to flag, the town meeting becomes unmanageable, and the town government is in danger of falling into unworthy hands. The remedy is municipal incorporation. The thickly inhabited part of the town secures a charter and becomes a borough or village or city and the people surrender a part of the public business to chosen agents. This change, however, usually does not extinguish town government within the boundaries of the new municipality, although it does take from it many of its former powers.

While town government in its pure form is found only in New England, modifications of it appear in those Western States whose population contains a strong admixture of New England emigrants, notably in Michigan, Illinois, Wisconsin, Minnesota, and Nebraska. Each of these States has provided by law for a system of local government which resembles more or less closely the New England system. In Michigan, for example, the voters of a township, after they have elected their local officers, meet in the afternoon in mass for the transaction of certain local business. At this meeting they may regulate the keeping and sale of gunpowder, the licensing of dogs, the vaccination of the inhabitants; they may order the purchase of books for the town library; they may under certain restrictions, and within certain limits, order the raising of money by taxation. In Illinois, in those towns which have adopted the township system, there is a similar meeting of the voters after the township officials have been elected. Here we have the form at least of the town meeting, but it does not appear that the spirit of the New England town vivifies these Western meetings. Township government in the West has always been and continues to be essentially representative. A New England town meeting may last for a day, sometimes for two days, and personal attendance for so long a time means inconvenience and money loss. Representative government, on the other hand, requires no such sacrifice. Because town government requires so much of the citizen's time and burdens him with such great responsibility, it has been extremely difficult to transplant it. The example of the town meeting has undoubtedly had great influence upon the course of local government in all parts of the Union, but it cannot be said that town government, either in spirit or in form, is vigorous in any State outside of New England.

Bibliography.— Howard: 'Local Constitutional History of the United States'; Adams, 'Germanic Origin of New England Towns'; Johnson, 'The Genesis of a New England State'; Parker, 'Origin, Organization and Influence of the Town of New England'; Bemis, 'Local Government in Michigan and the Northwest'; Shaw, 'Local Government in Illinois'; Fiske, 'American Political Ideas'; Bryce, 'American Commonwealth' (Vol. I.); Hosmer, 'Life of Samuel Adams' (ch. xxiii.).

S. E. Forman,
Author 'First Lessons in Civics.'

Town Government. See Municipal Government; Town and Town Meetings.

Towne Scientific School, a department of the University of Pennsylvania. See Pennsylvania, University of.

Townley Marbles, a notable collection of Greek and Roman sculpture, forming a portion of the gallery of antiquities in the British Museum; so named after Charles Townley, by whom the collection was made.

Townsend, town'zĕnd, **Charles Henry Tyler,** American entomologist: b. Oberlin, Ohio, 5 Dec. 1863. He studied medicine at Columbian University 1887–90, was assistant entomologist in the United States Department of Agriculture 1888–91, and was then appointed professor of entomology, physiology, and zoology at the New Mexican Agricultural College. He was temporary field agent in the division of entomology of the United States Department of Agriculture in Texas, Mexico, and New Mexico 1894–8, and since 1902 has been general manager of the Townsend-Barber Taxidermy and Zoological Company at El Paso, Texas.

Townsend, Edward David, American soldier: b. Boston, Mass., 22 Aug. 1817; d. Washington, D. C., 11 May 1903. He was graduated from West Point in 1837, served in Florida 1837–8 and on the Canadian frontier in 1838–41; was promoted captain in 1848, and colonel in 1861. In the year last named he was made chief of staff to Lieut.-Gen. Winfield Scott. In March 1865 he was brevetted major-general U. S. A., and was placed on the retired list in 1880. He published: 'Catechism of the Bible — The Pentateuch' (1859); 'Catechism of the Bible — Judges and Kings' (1862); 'Anecdotes of the Civil War in the United States' (1884).

Townsend, Edward Waterman, American author: b. Cleveland, Ohio, 10 Feb. 1855. He was for some years on the staff of the New York *Sun* and in 1895 became widely known by his 'Chimmie Fadden and Major Max' in which a typical New York boy of the rougher class is depicted. Later works include 'Chimmie Fadden Explains, Major Max Expounds' (1895); 'A Daughter of the Tenements' (1896); 'Lees and Leaven' (1903); 'Reuben Larkmead' (1905).

Townsend, George Alfred, American journalist: b. Georgetown, Del., 30 Jan. 1841. He was graduated at the Philadelphia High School in 1860 and entered journalism. He was special war correspondent of the New York *Herald* and *World* in 1861–5, afterward engaged as a lecturer, and in 1866–7 he was in Europe as

special correspondent in the Austro-Prussian war and later at the Paris Exposition. For many years after 1868 he was an editorial writer and correspondent on the staff of the Chicago *Tribune,* and his contributions to the press, under the penname "Gath," have been widely read. His publications include: 'Campaigns of a Non-combatant' (1865); 'The Real Life of Abraham Lincoln' (1867); 'The Entailed Hat' (1884); 'Mrs. Reynolds and Hamilton' (1890); 'Columbus in Love' (1892); etc.

Townsend, Laurence, American diplomat: b. Philadelphia 13 Aug. 1860. He was educated at the University of Pennsylvania and spent some six years in Europe in the study of international law and the history of diplomacy. He was first secretary of the American legation at Vienna 1893–7, minister to Portugal 1897–9, and has been minister to Belgium from the last named date.

Townsend, Luther Tracy, American Methodist clergyman: b. Orono, Maine, 27 Sept. 1838. He was graduated from Dartmouth in 1859 and from Andover Theological Seminary in 1862, served in the Federal army during a portion of the Civil War, and in 1864 entered the Methodist ministry. He was professor of Hebrew in Boston University 1868–70 and of practical theology there 1872–93. He has since been professor emeritus. He has published among many other works: 'Credo' (1869); 'Bible Theology and Modern Thought' (1883); 'Evolution or Creation' (1899); 'God's Goodness and Severity.'

Townsend, Meredith, English editor: b. 1831. He went to Bengal in 1848 where he was for 12 years editor and proprietor of 'The Friend of India,' and returning to England in 1860 became with R. H. Hutton (q.v.), joint owner of 'The Spectator,' of which he was joint editor till the death of Hutton in 1897. Since the last named year he has been sole editor of that important London weekly.

Townsend, Virginia Frances, American author: b. New Haven, Conn., 1836. She at one time edited 'Arthur's Home Magazine' and has been a popular writer for girls. Among her many published books may be cited: 'While It was Morning' (1859); 'Amy Deane, and Other Tales' (1862); 'The Battlefields of our Fathers' (1864); 'Janet Strong' (1865); 'One Woman's Two Lovers' (1872); 'Elizabeth Tudor' (1874); 'Only Girls' (1876); 'Six in All' (1878); 'Our Presidents' (1888); 'That Queer Girl'; 'But a Philistine.'

Townshend, town'zĕnd, **Charles,** 2D VISCOUNT, English statesman: b. Rainham, Norfolk, 10 March 1674; d. there 21 June 1738. On the death of his father, the first viscount, in 1687, he succeeded to the peerage and took his seat as a Whig in the House of Lords, 1695. He was one of the commissioners for arranging the Scotch Union (1706), was joint plenipotentiary with Marlborough in the conference at Gertruydenburg (1709), and as ambassador to the States-General signed the Barrier Treaty at The Hague 29 Oct. 1709. He was censured by the House of Commons for this action and declared an enemy to the queen and kingdom. He accordingly entered into correspondence with the Elector of Hanover who, on his accession as George I., appointed Townshend secretary of state, 1714. In 1717 he was made lord-lieutenant of Ireland; was again secretary of state from 1721 to 1730, when he retired by reason of disputes with his brother-in-law and colleague, Sir Robert Walpole.

Townshend, Charles, English statesman: b. 29 Aug. 1725; d. London 4 Sept. 1767. He was grandson of the 2d Viscount Townshend, was educated at Leyden (probably also at Oxford), and entered Parliament in 1747. The next year he received a minor office and in 1754 became lord of the admiralty. From this post he rapidly advanced and became a member of the Privy Council in 1757, secretary at war in 1761, and in 1766 chancellor of the exchequer. Pitt's entrance into the House of Lords and eventual incapacity through ill health left Townshend virtually at the head of the government, and he defied his nominal chief in declaring the right of the East India Company to territorial revenue, and made use of his official position to secure for himself a large share in a public loan. In 1767 he was defeated on his proposition for a land tax. On 13 May he introduced measures dealing with the American colonies, virtually reviving the principles of the Stamp Act, which had lately been repealed. The American Revolution was caused by the imposition of taxes which he proposed. His reputation as an orator was scarcely second to that of Pitt himself. Of his qualities Lecky has written: "Exuberant animal spirits, a brilliant and ever ready wit, boundless facility of repartee, a clear, rapid and spontaneous eloquence, a gift of mimicry which is said to have been not inferior to that of Garrick and Foote, great charm of manner, and an unrivaled skill in adapting himself to the moods and tempers of those who were about him, had made him the delight of every circle in which he moved, the spoilt child of the House of Commons." Consult: Cobbett, 'Parliamentary History of England to 1803' (1806–20); Fitzgerald, 'Charles Townshend, Wit and Statesman' (1866).

Township. See TOWN and TOWN MEETINGS.

Towns'ville, Australia, the most important town of northern Queensland, Australia, situated on Cleveland Bay on the east coast. It has a number of fine buildings, including a new cathedral, a new custom-house, the supreme court building, and a large prison. The chief industrial establishments are an iron foundry, an ice plant, a soap factory and meat packing houses. The town has a good harbor; it is the terminus of a railroad to Hughenden, and the chief outlet for the products of northern Queensland. The exports amount to nearly $15,000,000 annually. Pop. (1901) 12,717.

Toxicology, the study of poisons. The word poison is difficult to define, since many substances which in minute amounts exercise no harmful action on the body may in large quantities produce disastrous effects. Then again, some substances which are harmless when taken into the stomach, as water, for instance, if injected into a blood-vessel prove very dangerous, causing death at times from the destructive action of the water on the blood-cells. Moreover, the many studies of recent years on bacteria and other low forms of life have resulted in a new series of conceptions regarding the

poisonous actions of the compounds formed by these bodies; and still further, certain forms of perverted metabolism of the human body result in the production of certain products which, retained by the body, work harmful effects. (See AUTO-INTOXICATION; METABOLISM.) If all the different factors are taken into consideration, a strictly scientific definition of the word poison cannot be given. In general it is said that a poison is any substance which brings about a change in the molecular composition of an organ or organs, causing its functions to depart very distinctly from the normal. But what grade of molecular disturbance is necessary to make a substance a poison, or how far from the normal must be the functional alteration, it is impossible to say. Many substances, strychnine for example, while being distinctly poisonous in appreciable doses, are very useful and helpful to the body when given in small amounts. Infinitesimal doses of copper salts act as pronounced poisons on certain forms of lowly organized plants, while a higher plant, the potato, does not suffer from large doses used as a spray to kill insect or fungus-parasites.

The modern conception of poisonous action is essentially a physico-chemical one, the distinction between a molecular physical action and a molecular chemical action being difficult to make. But it is believed that for practically all forms of poisons a distinct alteration in the character of the cells of the body takes place, as well as a change in the chemical composition of the poisonous substance. It is impossible at the present time to summarize these changes. It is rarely that the reaction between the body-cell and the poison is purely of a physical nature, yet this very frequently happens in many poisons that act on the blood. By some of the poisons — the anilines, for example — the blood undergoes changes, not so much due to new chemical compounds formed as to physical changes in the tension of the blood-serum and the blood-corpuscles, whereby the blood-coloring matters stream out into the plasma, and the oxygen-carrying function of the blood is lost. Similar types of poisoning result from some of the metals, and the poison of the cholera organism is thought to act in a like manner. In other poisons there is a direct union of the ions of the poison with some constituents in the cells of the body, making new chemical compounds, and thus interfering with the molecular activities of the cells.

Von Jaksch has divided the poisons into two classes: the exogenous poisons, or those that come from without the body, and enter by way of the skin, the lungs, the stomach, or the intestines; and the endogenous intoxications that result from changes within the human body through disordered metabolism. Occasionally the former class may cause such changes in the body that death results from an intoxication of the second variety. Thus a severe irritant to the kidneys, such as cantharides, may cause such an acute inflammation of that organ that it cannot secrete urine, and the patient may die of uræmic poisoning. In much the same manner certain bacteria find entrance into the body and develop poisons both within the tissues and also in the intestinal canal, and furthermore provoke putrefactive processes in the food in the intestinal canal. This brings about a triple form of poisoning, as it were.

The different types of poisoning are many. They cannot all be given in the space here available, but the symptoms and general treatment of a few of the more common types of poisoning will be mentioned. Poisoning by the mineral acids, nitric, sulphuric, hydrochloric, is not uncommon. In these there is a marked caustic action, with intense burning pain when taken by the mouth. The lips are stained yellow, black, or white respectively, according to the acid taken. There is nausea, vomiting, and diarrhœa, with all the symptoms of an intense gastro-enteritis, with collapse, pale face, cold sweating extremities, small feeble pulse, rapid respiration; and the patient dies in intense agony. Treatment is by prompt washing out of the stomach with an alkaline solution, soap, washing-soda, or other mild alkali being useful. Then comes the use of heat, of mucilaginous drinks, such as white of egg, gum arabic, slippery elm, olive oil, milk, etc. The technical details require prompt medical attendance as soon as the washing out with the alkaline solution is commenced.

Oxalic acid is frequently swallowed by mistake. Here the staining is usually absent; the gastro-enteritis is marked as in poisoning with the mineral acids; there is great muscular weakness, and twitching of the muscles, particularly about the face; sometimes there are convulsions, and further symptoms of collapse are present. In treatment wash out stomach by tube, or by drinking large quantities of water with lime — teaspoonful of lime to quart of water — and stimulants. Following oxalic poisoning large quantities of water should be taken for a week or so to flush the surplus oxalates from the kidneys.

Poisoning by alkalies is infrequent. Occasionally sodium hydrate, or potassium hydrate, is swallowed. Lime is also taken by accident; so (rarely) is ammonia. The symptoms are much like those of poisoning by the mineral acids. There are no marked discolorations, as noted, but otherwise the symptoms are similar. Treatment is by rapid washing of stomach with weak acids, vinegar being the most convenient, and by demulcents, as in acid-poisoning.

The halogen compounds are very markedly poisonous as gases, notably chlorine, bromine, fluorine; and the iodides and bromides cause forms of chronic poisoning known as iodism and bromism (q.v.).

The heavy metals as such are not poisonous, but their soluble compounds are all poisonous. They vary widely, however, in strength. In order, from the strongest to the weakest, they are caustic or astringent; severe caustic metallic salts being in order, mercury, tin, silver, antimony, copper, zinc, iron, and aluminium. But in poisoning the acid part of the salt is of importance. From strongest to weakest these acids run: hydrochloric, nitric, sulphuric, phosphoric, acetic, citric, tartaric. If a caustic metal is combined with a caustic acid the resulting salt, if soluble, is a very powerful poison, mercuric chloride, or corrosive sublimate, being an illustration. If a weak metal like iron is combined with a strong acid the result is an intermediate poison like chloride of iron; when a weak metal, as lead, is combined with a weak acid, as acetic, lead acetate, sugar of lead, a weak poison, is formed. Thus the strength of a metallic salt may be calculated from the com-

parative positions of the metallic and acid ions. In all these metallic poisons albumen compounds are formed. The coagulum varies in all, and according to its solubility or insolubility the burning of the poison is more or less deep. In all the symptoms are analogous; there is severe gastro enteritis, with symptoms of collapse. The treatment is similar in all: washing of the stomach, white of egg, milk, demulcents, artificial heat, respiration, and afterward careful feeding.

Arsenic and phosphorus are poisons that give very similar symptoms: acute gastro-enteritis, with nausea, vomiting, purging; then some grade of apparent recovery, to be followed after a few days with a recrudescence of the gastro-enteritis and the development of secondary blood-vessel changes, which may cause minute hemorrhages in any part of the body. Then follow fatty degeneration and death. The commonest form of salt causing arsenic-poisoning is Paris green; while rat-poison and matches are responsible for most cases of phosphorus poisoning. Treatment of arsenic poisoning calls for prompt washing of the stomach, small doses of magnesia and water every 15 minutes for several hours, and stimulant supportives. Phosphorus can usually be detected by the odor. There should be prompt washing, and avoidance of oils, although castor-oil may help in getting phosphorus out of the intestinal canal. Authorities, however, prefer the saline cathartics. A prompt oxidizing agent, permanganate of potash, or hydrogen peroxide should be used, or small doses (1 to 2 grains), diluted, of copper sulphate.

For the effects of poisoning by the alcohols, see Alcoholism. Practically all of the anæsthetics (ether, chloroform, ethyl chloride, etc.), and hypnotics (chloral, paraldehyde, trional, sulphonal, veronal, etc.) belong to the alcohol group (see Alcohol), and the symptoms are closely allied.

Phenols form a distinct group in which carbolic acid, creosote, creolin, lysol, resorcin, pyrogallic acid, thymol, guaiacol, naphthaline, salol, etc., belong. They cause symptoms closely resembling one another. Carbolic acid may be taken as the type. This causes gastro-enteritis, with severe pain, white scar of lips and throat, buzzing, dizziness, smoky to blackish urine, pale, bluish face, weak heart, quick breathing, coma, and sometimes convulsions. Treatment is by quick washing of the stomach. A mixture of lime and sugar of syrupy consistency, Epsom salt, milk, white of eggs, cardiac stimulants, and artificial respiration are all valuable.

Another large group of poisons, the anilines, includes many of the modern drugs, such as acetanilid. Closely allied are different aniline dyes. Also phenacetin, antipyrin. In these the characteristic signs of poisoning are somewhat similar to those seen in the phenol group, but in the more pronounced ones of this series the main changes occur in the blood. There is blueness of the skin and lips, difficulty in breathing, sometimes pinkish to purplish urine, rapid and feeble heart action. The chief changes are due to a partial destruction of the red blood-cells. In phenacetin the blood rarely disintegrates as in antifebrin or acetanilid; whereas in antipyrin there is no real blood action. The treatment of these forms is by prompt evacuation, cardiac stimulation, oxygen, and most important of all, artificial respiration.

Alkaloidal poisons (see Alkaloids) are numerous. The commonest forms of poisoning from these, the most powerful poisons, are morphine (opium, laudanum, paregoric), strychnine (nux vomica), atropine (belladonna,) cocaine (coca), aconitine (aconite), and nicotine (tobacco). In acute opium poisoning the classical symptoms are drowsiness, coma, small pin-point pupils, loss of pain, slow breathing (6 to 8 to a minute), moist skin, dry mouth, rousing with more or less active consciousness, and quick relapse. Treatment is by washing the stomach with hot strong tea or coffee, by mouth or by rectum, and by artificial respiration. Too much walking of the patient about is not desirable.

Strychnine poisoning causes twitching of muscles, cramps, irregular muscular movements, convulsions at slightest jar or touch, fixation of muscles of breathing, with cyanosis. Treatment is by great quiet, alcohol, chloroform, and stimulants.

Belladonna poisoning shows wide-awake, restless consciousness, sometimes active, busy delirium; dry mouth, skin hot and flushed, pupils widely dilated and paralyzed to light and accommodation, rapid feeble heart, and rapid respiration. Treatment is by prompt evacuation of stomach, sodium bromide, opium, caffeine, or coffee.

Another group of glycoside poisons (see Glycosides) is characterized by a great similarity in action. Many of these are used in medicine, and some were used as arrow-poisons by wild natives. This group contains digitalin (digitalis), strophanthin (strophanthus), convallarin (lily-of-the-valley), bryonin (bryonia), apocynin (dogbane), oleandrin (oleander), scillain (squills), etc. These are all heart poisons. They first quicken the heart, then slow and regulate it, hence their usefulness in many heart diseases; but in overdoses they paralyze the heart by overstimulation. As these drugs rarely cause poisoning, the treatment is omitted.

Tox albumins form a group of special character, and all are very violent. Some are of vegetable and others of animal origin. The most important are abrin (in jequirity-seeds), ricin (from the seed-coats of the castor-oil bean — frequently causing death in children who eat the whole bean), phallin (in poisonous mushrooms), rattlesnake poison, cobra poison, heloderma, and the poison of lizards, etc.

The most important of the bacterial toxins, some of which might be classed here, are discussed under their respective heads. For the endogenous intoxications see the articles on the infectious diseases, cholera, diphtheria, tuberculosis, pneumonia, tetanus, typhoid, etc.; also the diseases of metabolism, uræmia, diabetes, Basedow's disease, Addison's disease — thyroidism, myxœdema, cretinism, etc. See Toxins and Anti-Toxins.

Consult: Von Jaksch, 'Die Vergiftungen' (1897); Kobert, 'Lehrbuch der Intoxikationen' (1902); Kunkel, 'Handbuch der Toxikologie' (1900); Kionka, 'Grundriss der Toxikologie'; Peterson and Haines, 'Text-book of Legal Medicine and Toxicology,' Vol. II. (1903).

Smith Ely Jelliffe, M.D., Ph.D,
Professor in Pharmacognosy and Instructor in Therapeutics, Columbia University.

Toxins and Antitoxins. After it had been established through the researches of Pasteur, Koch and others that the infectious diseases are due to low forms of life, known as bacteria, the question soon arose, "How do bacteria act in causing disease?" Since anthrax was the first disease demonstrated to be due to bacteria, attempts to answer this question have generally been made by reference to the micro-organism of this affection, and the question is changed so as to read, "In what way does the bacillus anthracis induce the symptoms of this disease, and cause death?" Of the many answers proposed to this question, the following are most deserving of notice:

(1) It was suggested by Bollinger that apoplectiform anthrax is due to the de-oxidation of the blood of the animal by the bacilli. In other words, it was thought that the germs manifest their deleterious action by depriving the red blood corpuscles of oxygen. This had some support in the resemblance of the symptoms of anthrax to those of poisoning with carbonic acid gas. The most prominent of these symptoms are dyspnœa, cyanosis, convulsions, dilated pupils, subnormal temperature, and in general the phenomena of asphyxia. It was also found that postmortem examination reveals conditions similar to those when death is due to withdrawal of oxygen; the veins are distended, the blood is dark, and thick, the parenchymatous organs are cyanotic and the lungs are hyperæmic. This theory presupposed a large number of bacilli in the blood, and this accorded with the estimate of Davaine, which placed the number at from eight to ten million in a single drop, but later a more careful observation showed that in some instances animals die from anthrax when the blood is very poor in bacilli. Cases of this kind were reported by Virchow and later by Bollinger himself. Indeed, it has been shown that animals may die from anthrax while the bacilli are still retained in the organs, and before they appear in the general circulation. These and other investigations of similar character caused those engaged in this field of research to doubt the truth of the theory of Bollinger, and these doubts were soon converted into positive evidence against it. Oemler found that the blood, even when rich in anthrax bacilli, still possesses the bright red color of oxy-hæmoglobin. Toepper and Roloff observed cases of apoplectiform anthrax in which no difficulty of respiration was apparent, and Toussaint caused animals which had been inoculated with the anthrax bacillus to breathe air containing a large volume of oxygen and found that this treatment did not modify the symptoms or retard death. Finally Nencki determined the amount of physiological oxidation going on in the bodies of animals sick with anthrax, by estimating the amount of phenol excreted after the administration of one gram of benzol, and found that the oxidation of the benzol was not diminished by the disease. Thus the theory that germs destroy life by depriving the blood of its oxygen has been found not to be true for anthrax, and if not true for anthrax, certainly it cannot be for any other known infectious disease. The bacillus anthracis grows best in the presence of a large amount of oxygen, but many pathogenic bacteria are destroyed when this element is present in large amount. Again, in many infectious diseases the bacteria are not found in the blood at all, and lastly, the symptoms of these diseases are not those of asphyxia. These facts have caused a complete abandonment of the theory proposed by Bollinger.

(2) If a properly stained section of the kidney or liver taken from an animal dead from anthrax be examined under the microscope, the bacilli will be found to be present in such large numbers that they form emboli which not only close, but actually distend the capillaries and even larger blood vessels, and thus interfere with the normal functions of the organ. From this appearance it was inferred that the diseased condition might be due to the accumulation of bacteria in important organs, mechanically interrupting their functions. This is known as the mechanical interference theory. If anthrax were the only infectious disease, or if in other infections the germs were as numerous as they are in anthrax, the mechanical interference theory would still have strong support, but such accumulation of germs in the organs is not seen in other diseases. Therefore the mechanical interference theory does not furnish the proper answer to the question, "How do germs cause disease?"

(3) It was thought possible that the deleterious effects of pathogenic germs might be due to their consumption of a large proportion of the proteids of the body, thus depriving it of its sustenance. It is well known that proteids are necessary to the building up of cells, and also that micro-organisms feed upon proteids. However, this theory is untenable for several reasons: In the first place, in many of the infectious diseases life is destroyed so quickly that the fatal effects cannot be supposed to be due to the consumption of any large amount of proteid. In the second place, the distribution of the bacteria in the body is such that they do not come in contact with any large proportion of the nutritive proteids. In the third place, in the majority of bacterial diseases the symptoms are not those which would be produced by withdrawing from the various organs their food; or, the symptoms are not those of starvation.

(4) It has been suggested that pathogenic bacteria manifest their deleterious effects by destroying blood corpuscles, but in many of the infectious diseases the micro-organisms, although abundant in certain organs, are not found in the blood. Moreover, microscopical examination shows that there is no marked or constant disintegration of the corpuscles.

(5) Having found all of the above mentioned theories untenable, and being impressed by the results obtained by the chemical study of putrefaction, bacteriologists have been led to inquire into the possibilities of the symptoms of the infectious diseases and death being due to chemical poisons. In following out this theory the following possibilities suggest themselves:

(a) The bacteria may produce or be intimately associated with soluble chemical ferments which produce the symptoms of the disease and death. This theory at one time had a number of ardent supporters, among whom might be mentioned the eminent scientist, de Bary, but Pasteur proved the theory false when he filtered anthrax blood through earthen cylinders, inoculated animals with the filtrate, and

failed to produce the disease and death. A similar demonstration was made by Nencki, when he inoculated a 2 per cent gelatin preparation with the anthrax bacillus, which liquefied the gelatin, and on standing, the bacilli settled to the bottom, after which the supernatant fluid, which was clear and alkaline in reaction, was filtered and injected into animals without effect.

(b) Bacteria may either directly or indirectly act as ferments, splitting up complex proteids in the tissue and producing among these cleavage products the specific poisons which induce the characteristic symptoms of the disease, and may cause death. This belief, once quite generally held, has stimulated numerous investigations, some of which have led to valuable discoveries; but at present it is safe to say that among the bacterial split products formed either in artificial culture media or in the body there is not found one which on account of its intensity of action or from the nature of the symptoms which it causes, can be regarded as the specific poison of any of the infectious diseases.

(c) Chemical poisons may be produced by the cellular activity of bacteria, much in the same way as morphine is formed in the poppy. This theory supposes that the formation of bacterial poisons is a synthetical rather than an analytical process. That many of the pathogenic bacteria do build up poisons synthetically is shown by the fact that they retain their virulence when grown in artificial cultures made up practically of inorganic substances, and containing only minute quantities of organic bodies, so small in comparison that it must be admitted that the specific toxins of these micro-organisms cannot result from their cleavage action. Most bacteriologists now agree that bacteria cause disease and death by the elaboration of chemical poisons; that these poisons are formed synthetically, and that they are formed within the bacterial cell.

Having reviewed briefly the above given theories, I will now give what appears to be, in the present state of our knowledge, an accurate definition of an infectious disease. An infectious disease arises when a specific pathogenic micro-organism, having gained admittance to the body, and having found conditions favorable, grows and multiplies, and in so doing elaborates a chemical poison, which induces its characteristic effects.

It is impossible to study the action of the bacterial toxins without giving some consideration to the subject of immunity. Even primitive man must have observed that all animals are not alike affected by the same diseases and that epidemics which decimate certain species are wholly without effect on the health and life of others. Very early in his history, man undoubtedly recognized the fact that one attack of certain diseases gives a more or less permanent immunity to the same disorder. It has also been long recognized that certain infectious diseases, such as diphtheria and scarlet fever, which are so highly fatal among children, rarely attack adults. The question of immunity has long been, is, and probably will continue to be one of the most perplexing problems which medical science has attempted to solve. With so many chances of infection, the question is often asked, how is it that the human race continues its existence, and why has it not been swept out of the world by epidemics. The answer to this question is not easy and the time has not yet come when it can be given in a perfectly satisfactory manner. However, we are now in possession of numerous facts bearing on this point, and I will attempt to briefly state the most important of these. It should be understood that the factors involved in securing immunity against infectious diseases are multiple in number and varied in character. It is a mistake to attempt to explain immunity as being due to one or even to a few anti-bacterial properties of the animal body. Some of the factors which lead to immunity to the infectious diseases pertain to the animal organism, while others are due to limitations of the capability of growth on the part of the infecting agent. For example, few, if any, of the pathogenic bacteria can penetrate the unbroken skin, and infection through this avenue occurs only when there is some break in the continuity of the covering of the body. On the other hand, some of the most powerful pathogenic micro-organisms are practically harmless even when introduced under the skin, while they may speedily cause death when taken into the alimentary canal. This is true of the micro-organisms of typhoid fever and Asiatic cholera. On the other hand the bacilli of tetanus and anthrax may do no harm when taken into the healthy stomach, while they cause speedy death when injected subcutaneously. From these examples it must be evident that it is not sufficient for a pathogenic bacterium, even one to which man is highly susceptible, to come in contact with the human body in order to cause disease; it must first find its suitable port of entry, and even after this has been reached there are other dangers to the life of the invader with which it may have to meet before it reaches the place where it can entrench itself and begin the struggle. The bacteria may be cast out by the mechanical movements of the epithelial cilia in the upper air passages; they may be killed by coming in contact with such fluids as the gastric juice; or they may be hurried through the body and cast out in the excretions, as undoubtedly sometimes happens to typhoid bacilli when taken into the alimentary canal. Every poison producing germ is not capable of maintaining even for a short time a parasitic existence. The obligate saprophytes, which are numerous, and some of which undoubtedly produce powerful toxins, are capable of harming man only under certain conditions which are especially favorable to their growth and multiplication. Many members of this class are not capable of growth and reproduction even when introduced into the animal body, and consequently they are harmful to man only when their already formed toxins are introduced into his body. In other bacteria the toxins are locked up in the cells and it is only when some unusual condition gives opportunity for the disintegration of the bacterium that its toxin is liberated and may do harm. This is apparently true of the colon bacillus, which normally dwells in the intestines of man, and which forms a most powerful intracellular poison. Ordinarily this bacterium is harmless to man because its toxin is held within the cell and cannot be absorbed through the intestinal wall, but if the colon bacillus finds its way into the peritoneal cavity where the cell is disinte-

grated, its toxin is liberated to the great danger of the host.

It is customary to discuss the subject of immunity under the following heads: (1) Natural immunity, or that possessed by certain species or races of animals at all times against certain diseases; (2) inherited immunity, which may be transferred from the mother to the fœtus through the placental circulation, or from the mother to the child through the milk; (3) acquired immunity, or that which is secured by one attack of the disease, by vaccination, or by repeated treatment with sterilized or unsterilized cultures. Acquired immunity may be either active or passive. By an active immunity we mean that form which is induced by one attack of the disease, or by the direct treatment of the animal with filtered or unfiltered cultures and in which case the antitoxic or anti-bacterial substance is produced in the body of the animal thus treated. Passive immunity, on the other hand, may be secured by injecting the blood serum of an animal actively immunized into a second animal. As an illustration of active and passive immunity, I may refer to the method by which diphtheria antitoxin is prepared and the purpose for which it is used. The horse is treated with successive, non-fatal, gradually increased doses of diphtheria toxin until this animal furnishes a serum containing a large amount of diphtheria antitoxin. The horse's serum when injected into a child sick with diphtheria supplies the antitoxin which combines with the toxin, and thus protects the tissues of the child from the injury which would otherwise be inflicted on the cellular elements by the noxious agent. In this illustration, an active immunity is induced in the horse, and as a result of the establishment of this condition, certain cells within the animal are stimulated to a form of activity by which the antitoxin is elaborated. In other words, the horse treated with successive, gradually increased doses of the diphtheria toxin comes to possess an active immunity. The horse's serum, containing the antitoxin, is injected into the child, which for the time being becomes physiologically a part of the horse, and possesses only a passive immunity.

It is a fact of common observation, as well as of experimental demonstration that the lower animals are wholly immune to many of the infections to which man is readily susceptible. Among men typhoid fever is one of the grave diseases, causing great morbidity and increasing considerably the mortality lists, while among the lower animals this disease does not occur naturally nor has anyone been able to induce it by inoculation with the bacillus. Scarlet fever, yellow fever, leprosy and measles are other diseases which inflict themselves upon mankind, but to which the lower animals are apparently insusceptible. Some of the infectious diseases are prevalent among certain species of animals, while upon others they seem to be without effect. Anthrax is common among cattle and sheep, while many carnivorous animals wholly escape this infection. It is worthy of note that in nature some animals, such as the guinea pig and rabbit are not known to suffer from epidemics of anthrax, but this disease can be easily induced in these animals by artificial inoculation. One of the important factors in natural immunity is the fact that the toxicogenic germ is not able to multiply in the animal body. For instance, the bacillus pyocyaneus is frequently found upon the surface of man's body, especially in the axillary and inguinal regions, and sometimes it occurs in the intestines, but notwithstanding this almost constant proximity of this organism, man is rarely injured by it, yet nevertheless this bacillus produces a toxin to which man is susceptible. The micrococcus prodigiosus produces a powerful toxin and yet it is not pathogenic to man, or to any other animal so far as is known. The sarcines are usually regarded as altogether harmless, but it has been shown that the intraperitoneal injection of the cellular elements of these organisms is followed by death. Another important factor in the production of natural immunity is, according to Metschnikoff, to be found in the action of certain phagocytic cells in the animal body. When pathogenic bacteria are introduced into a naturally immune animal, they are seized upon and devoured by the phagocytes. When the germ is introduced into a place where no phagocytes are present, as, for instance, under the skin, into the cornea, or into the anterior chamber of the eye, the mobile phagocytes collect at the point of bacterial invasion, engulf the bacterial cells by the aid of their pseudopodia, and then digest them, or in some other way deprive them of their capability of harming the body. This method of disposing of foreign substances introduced into the animal body is known as phagocytosis. Even those, who have brought the best arguments against Metschnikoff's doctrine of phagocytosis, admit that this phenomenon is especially noticeable in animals naturally immune, or at least that in naturally immune animals phagocytosis is a frequently observed phenomenon. When anthrax bacilli are injected under the skin of a dog, an animal not susceptible to anthrax, a very energetic phagocytosis takes place. Even anthrax spores are taken up by the phagocytes, and sometimes develop into bacilli within the phagocyte, thus destroying the organism which has engulfed them, but ordinarily their multiplication is rendered impossible. The phenomenon of phagocytosis is explainable only on the supposition that the phagocyte contains some chemical substance by virtue of which it destroys the captured micro-organism. What this chemical poison is or whether it is the same in all phagocytes, we cannot say. All phagocytes contain nucleic acid, and the germicidal properties of this substance have been abundantly demonstrated, but whether or not there may be other and more powerful bactericidal agents in certain phagocytes, we do not know.

Inasmuch as this article is not devoted to a discussion of immunity, we will pass by the inheritance of immunity with the simple statement that it is a form of acquired immunity in which the antitoxin is passed from the mother to the child either through the placental circulation before birth or through the milk after birth. The relative insusceptibility of nursing children to many of the infectious diseases is well known.

The investigation of acquired immunity has furnished a rich field for research to the bacteriologist, and there are probably more men now working at this problem than upon any other subject connected with preventive medi-

cine. As has already been pointed out, primitive man must have observed that one attack of certain diseases gives to those who recover more or less permanent immunity to that disease. The Chinese recognized this fact many centuries ago, so far as smallpox is concerned, and this led to their practice of inoculation for this disease. The next step made in the study of acquired immunity was the discovery of vaccination for smallpox, as practised by Jenner, but inasmuch as up to that time the specific bacteria remained unknown, the philosophy of vaccination could not be explained. The scientific study of acquired immunity dates from the early investigations of Pasteur, who in 1880 discovered that inoculations with non-virulent cultures of chicken cholera gave immunity to subsequent inoculations with a virulent culture of this micro-organism. Acquired immunity may be obtained in either of the following ways: (1) By recovery from an attack of the disease; (2) by vaccination, or by inoculation with a weakened or attenuated culture of the germ causing the disease; (3) by the employment of sterilized cultures of the specific micro-organism or by the use of its toxins. In this article I will have to do only with the action of toxins, and it will be seen that in order to properly discuss this subject it is necessary to bring in a few facts concerning immunity.

A toxin is a poison to which an active immunity can be secured by injecting successive and increasing doses of the substance. In order for a substance to be classified as a toxin it must be shown that it will produce an anti-body in some animal. Toxins are poisons, but all poisons are not toxins. The term poison is a larger one, and includes the toxins. Morphin, strychnin and other vegetable alkaloids are poisons but are not toxins. A certain amount of tolerance can be established for morphin in the body of man, but there is not formed in man's blood any anti-body to any of the vegetable alkaloids or mineral poisons. Toxins are of bacterial, vegetable, and animal origin. The bacterial toxins include the specific causes of all the infectious diseases. The vegetable toxins, such as ricin, found in the castor-oil bean, and abrin, found in the seed of the jequirity, are of more scientific than practical importance. Animal toxins are found in the venom of snakes, and possibly in the saliva of certain batrachians and insects. In this article I will confine myself, for the greater part, at least, to a discussion of the bacterial toxins.

Although, as we shall see later, there are good reasons for believing that all bacterial toxins are formed within the bacterial cell, it is customary to divide these toxins into two classes. Those of the first class are known as extracellular, and those of the second class as intracellular toxins. When the bacilli of diphtheria and tetanus are grown in liquid culture media the toxins produced by these organisms are found in solution in the medium in which the germs have grown, and when such a culture medium is freed from bacteria by filtration through porcelain and the germ-free filtrate injected into animals, symptoms of poisoning and death result. This demonstrates that these organisms form toxins which are readily soluble and which are easily split off from the bacterial cell and pass into solution. Ordinarily these are designated as extracellular toxins, although, as has been stated, there are many reasons for believing that they are formed within the cell from which they are detached at incubating temperature in the presence of water. On the other hand, if the typhoid or colon bacillus be grown in liquid culture media and the germs removed by filtration, the filtrate is without effect upon animals, while the germ substance even in small amount when suspended in water or other harmless media and injected into animals causes death. In other words, these last mentioned organisms elaborate toxins which remain as constituents of the cell until cellular disorganization takes place in the body, and it is not until this happens that the toxin is liberated and manifests its activity. This is sufficient to explain what is meant by extracellular and intracellular bacterial toxins. I will now proceed to briefly state the properties of a few of the toxins belonging to each of these groups.

The toxin of diphtheria is obtained by growing a virulent culture of the diphtheria bacillus at the temperature of the body for a period of time varying from one to three weeks, and then removing the germs by filtration. The strength of the toxin solution thus obtained depends upon many conditions, all of which must be carefully provided for when one attempts to prepare a highly potent culture. The medium largely employed for this purpose consists of beef tea containing 1 per cent of sodium chloride, from 1 per cent to 3 per cent of pepton, and made feebly alkaline by the addition of sodium carbonate. This medium is placed in glass flasks, each of which should not be more than one third full in order that there may be a large surface exposed to the air. The flasks are inoculated by floating small bits of diphtheria culture taken from an agar tube on the surface of the beef tea. After inoculation these flasks are kept at 37° C. for from one to three weeks, after which they are filtered and are ready for use in the production of antitoxin. The toxin solution speedily loses its toxicity when kept freely exposed to the air and light. It becomes necessary therefore to protect it in some way. A good method consists in covering the fluid in the glass flask with a layer of toluol. This excludes the air and then the flasks are kept below 15° C. in a dark room. When some of the solution is to be used it is withdrawn by means of a pipette through the layer of toluol and in this way a good toxin preparation may preserve its toxicity for two years. In most laboratories engaged in the preparation of antitoxin the toxin solution is not considered sufficiently strong unless .02 of a cubic centimetre of it suffice to kill a guinea pig weighing 250 g., within three to five days. However, it is not always easy to prepare a culture whose toxin will come up to this standard, but occasionally one succeeds in making a preparation much stronger than this, and when a good toxin has been prepared it is important to preserve it according to the method already given.

The toxin prepared as stated above is injected into horses in gradually increasing doses. At first a small amount is used and this causes, as a rule, evidence of slight illness in the animal. It probably develops some fever, loses its appetite, and has a roughened coat, but returns to a

normal condition in a few days; when the injection is repeated. After the third or fourth treatment the quantity of toxin used is rapidly increased, and it is soon found that the animal bears without apparent effect many times the quantity which, if used without previous treatment, would have caused death. After this point has been reached the horse is bled from some large vein in the neck, the blood thus obtained allowed to coagulate, and the serum of this blood is found to have antitoxic properties. The strength of the antitoxin is determined by ascertaining how much toxin a given quantity of the blood serum from the immunized horse will neutralize. The minimum lethal dose of the toxin for a guinea pig weighing from 200 to 300 grams is determined, and the amount of antitoxin necessary to neutralize 100 minimum lethal doses of the toxin is known as an immunity unit. This amount of antitoxin mixed with 100 minimum lethal doses of the toxin in a test tube and injected into a guinea pig preserves the animal from any injury from the toxin. The antitoxins now generally prepared contain from 500 to 5,000 immunity units without reference to the amount of fluid contained in the dose. I mean by this that a flask of antitoxin marked 500 immunity units contains enough antitoxin, whether it be in one cubic centimetre or in ten, to neutralize 500 times 100 minimum lethal doses of the toxin.

Diphtheria toxin has never been obtained in a chemically pure condition. It can be said with considerable certainty that it is not a proteid body, because the purest preparations that have been made fail to respond to characteristic proteid reactions. Its molecular weight is evidently much less than that of the antitoxin, because the toxin filters readily through porcelain, and diffuses quickly in gelatin, while, on the other hand, the antitoxin is largely removed by filtration of its solution through porcelain and it does not diffuse through gelatin. The toxin is highly susceptible to heat, a temperature of 60° being sufficient to markedly, although not wholly destroy its toxicity. As has already been stated, exposure to air and light speedily robs this substance of its toxicity. A like effect is induced by the presence of both mineral and vegetable acids. Even lactic and tartaric acid speedily render it wholly inert and its toxicity is decreased, although not completely destroyed, by borax and boracic acid. It is especially susceptible to the action of oxidizing agents, such as permanganate, chlorine, iodine, etc. It diffuses readily through parchment, but does not pass through animal membranes nor through collodion sacs. It is insoluble in absolute alcohol and long contact with this agent destroys its toxicity. It is also robbed of its virulence by the digestive ferments present in the stomach and intestine. From its solutions it is carried down mechanically upon the addition of chloride of calcium, which precipitates calcium phosphate. In this respect, as well as in its susceptibility to heat, diphtheria toxin bears a close resemblance to the enzymes, and there are many who believe that it should be classed with these bodies.

Animals differ widely in their susceptibility to diphtheria toxin. This is true of individuals and still more markedly true of species. The most susceptible animal is the guinea pig. Horses, sheep and goats are susceptible, while rabbits are less so, and white mice practically refractory. It lowers the temperature, and when given in poisonous quantities may reduce the body heat to 25° C. There has been considerable discussion concerning its action on the heart. Some experiments indicate that its action upon this organ is direct, while the bulk of evidence indicates that it is not direct but only a secondary effect upon this important organ.

The diphtheria antitoxic serum prepared by the method already given in horses and now generally used in the treatment of diphtheria, has been the means of reducing the mortality from this disease from more than 50 per cent to less than 5 per cent. Indeed, when an efficient serum is used on the first day of the appearance of diphtheritic membrane in the child's throat, recovery is almost absolutely certain, the mortality under this condition being less than 2 per cent. As a rule the serum is preserved by the addition to it of 0.5 per cent of phenol or 0.3 per cent of tricresol. Filtration of the serum through porcelain robs the substance of its antitoxic properties, the antitoxin being held in the filter on account of its relatively large molecule. Heating antitoxic serum to from 60° to 70° destroys its value. On the other hand, the dried antitoxin will bear a temperature of 110° for half an hour without injury.

It is highly probable that diphtheria antitoxin is an albuminous substance. It certainly has none of the resemblances to ferments shown by the toxin. It is in and of itself perfectly harmless to the animal body. All the slight disturbances, such as urticaria, which result from the use of diphtheria antitoxic serum, are due to other constituents of the serum and not to the antitoxin. It may be precipitated by metallic salts as other albuminous bodies are, but it is not carried down mechanically as happens to the toxin and to ferments. There are some reasons for believing that antitoxin belongs to the globulins. However, nothing can be said with certainty on this point.

Tetanus toxin is probably the most poisonous substance known. It is prepared by growing tetanus bacilli in simple bouillon or on blood serum under anærobic conditions. The germ is removed by filtration through porcelain. The toxin is easily destroyed by both physical and chemical agents. Exposure to air and light soon robs it of its toxicity. So markedly is this true that even in filtration care should be taken to exclude both air and light. According to the experiments of Kitasato, exposure to sunlight for from 15 to 18 hours completely destroys the poison. Other observers say that the same effect is produced in half this time. Oxidizing agents, such as dilute solutions of potassium permanganate, mineral and vegetable acids destroy its toxicity promptly. The tetanus toxin may be easily obtained in dry form by precipitation with ammonium sulphate, extraction with water, dialysis and evaporation in vacuo. However it should be understood as thus prepared it is by no means pure. It is probable that the toxin is carried down mechanically with the albumoses that are precipitated on the addition of ammonium sulphate. The purest preparations that have been made give the biuret and the Millon reactions, and there are those who believe that tetanus toxin is an albumose. Ac-

cording to Brieger and Cohn, the fatal dose of the pure toxin for a mouse is about 0.0000005 gram and for man 0.00023 gram. The horse is said to be the most susceptible animal. It requires 2,000 times as much of the poison per kilo of body weight to kill a rabbit as it does to kill a horse, and the chicken is a hundred times less susceptible than the rabbit. When given by the mouth, the tetanus toxin is without poisonous properties, but when injected subcutaneously or intravenously in sufficient amount it speedily kills. It is most potent, however, when administered subdurally or intracerebrally. This is due to the fact that it combines with the tissue of the nerve centres. Recent experiments show quite conclusively that when tetanus toxin is injected subcutaneously or when it is developed by the growth of the tetanus bacillus in a wound, the toxin is conveyed to the nerve centres through the axis cylinder of motor nerves, and that symptoms of tetanus first develop when the anterior horns of the spinal cord are reached. This explains why there is always a period of incubation, both after the subcutaneous injection of the toxin and as a result of a tetanus infected wound. It also makes clear the observation so frequently recorded that this period of incubation is shorter the nearer the site of inoculation is to the central nervous system. That tetanus toxin does form a compound with certain constituents of the tissue of the central nervous system is shown by the fact first observed by Wassermann that when the toxin is rubbed up in a mortar with brain or spinal cord tissue, it is completely neutralized. In other words, it forms a compound with some constituent of this tissue. This probably is what happens when the poison is generated in the body of man or some other animal and as a result of this injury to the nervous system tetanic spasms occur.

A tetanus antitoxin has been prepared in a manner similar to that employed in the preparation of diphtheria antitoxin. Unfortunately, however, the brilliant practical results obtained in the treatment of diphtheria with antitoxin have not been secured in the treatment of tetanus. The value of tetanus antitoxin as a prophylactic agent is established, and this agent should be used whenever a wound contaminated with dirt or powder or anything else suspicious of tetanus is dressed, and subsequent treatments with antitoxic serum should be employed on the 3rd, 5th and 7th days after the first dressing of such wounds. As a curative agent, tetanus antitoxin has not given satisfactory results. However, there are cases on record in which tetanus antitoxin has apparently been of curative value. Moreover, methods of preparation and details of treatment are constantly being improved, and it is altogether within the range of possibility that tetanus antitoxin may still prove of great value as a curative agent.

Bacillus botulinus, an organism found by Van Ermengem in poisonous ham, produces a soluble, highly active toxin. It is estimated that the fatal dose for man is about 0.035 mg. It causes dilatation of the pupil, loss of voice, retention of urine, and constipation, followed by paralysis and terminating in death. It is highly susceptible to air and light, and is destroyed by a temperature of 58° C., continued for three hours. Alcohol, ether, and oxidizing substances destroy it promptly, while reducing agents have but little effect. Unlike the toxins heretofore discussed, it is absorbed from the alimentary canal and may produce its harmful effects when taken by the mouth. The digestive ferments of the stomach and small intestine are without influence upon it. The botulis toxin, as it is called, is apparently a specific nerve toxin. According to Marinesco and others it causes marked changes in the cells of the anterior horns, leading to chromatolysis and disintegration of Nissl's granules. Outside of the body this toxin forms an inert compound with central nervous tissue. In this respect it resembles the tetanus toxin. Kemper has prepared an antitoxic serum by immunizing goats, but the practical value of this preparation has not yet been demonstrated.

Bacillus pyocyaneus forms a slightly soluble toxin and therefore stands, as it were, midway between those germs forming extracellular and those forming only intracellular toxins. The soluble toxin of the pyocyaneus is much more resistant to both physical and chemical agents than either the diphtheria or the tetanus toxin. Wassermann has prepared an antitoxin which protects animals against inoculation with fatal doses of the living germ. This toxin is at present at least of more theoretical than practical value.

We now turn to those bacteria which produce only intracellular toxins. It is only within very recent times that any satisfactory work with these toxins has been done. It has been found in the writer's laboratory within the last few months that the colon, typhoid and anthrax bacilli may be split up by sodium alcoholate and that among the split substances thus obtained there are toxins with which animals may be immunized to the respective micro-organisms. In doing this work, these bacteria have been grown upon specially devised tanks in such a way that it has been possible to obtain several kilograms of germ substance free from culture medium. The germ substance thus obtained has been extracted first with alcohol, and then in Soxhlet extractors with ether in order to remove all substances soluble in these agents. After this extraction the substance has been ground to a powder in agate mortars and dried. These powders constitute what is known as the crude toxin. The fatal dose of these crude toxins for guinea pigs weighing from 200 to 300 grams is for the colon germ, one part of toxin to 50,000 of animal body weight, for the typhoid germ, one part to about 30,000, and for the anthrax germ one part to 2,500. These crude toxins have been heated for from 1 to 2 hours with a 2 per cent solution of sodium hydrate in absolute alcohol. This breaks up the germ substance into a part soluble and a part insoluble in absolute alcohol. The part soluble in absolute alcohol contains all the toxin and some other substances as well — in fact only about 15 per cent of the part soluble in absolute alcohol is toxin, and with these animals have been immunized and protected against fatal quantities of the living germ. The fatal dose of the colon toxin thus prepared for guinea pigs is between one and two milligrams, while that of the typhoid and anthrax bacilli is somewhat larger. It remains to be seen how potent a serum may be obtained with these toxins, and whether or not such a serum will be of practical value The re-

searches of other investigators have not given very satisfactory results, but a brief statement of some of these may be of value. Brieger, Kitasato, and Wassermann found by heating typhoid cultures to from 80° to 90° C., and precipitation with alcohol they obtained a substance which was feebly toxic and slightly immunizing. Sanarelli grew a highly virulent typhoid germ in glycerin bouillon for a month, then sterilized at 60° C. and obtained a feeble soluble toxin, the fatal dose of which for rabbits was 10 cc. per kilogram. Rodet found in filtered typhoid cultures a substance of slight toxicity causing some elevation of temperature and local necrosis. Conradi obtained a poisonous body by the antiseptic autolysis of typhoid bacilli. In this way he secured a soluble cell free poison which killed guinea pigs in doses of 0.2 cc. Macfayden ground up typhoid bacteria at the temperature of liquid air and obtained a highly poisonous substance with which he has been able to produce a slight degree of immunity. It should be understood, however, that by this method the only thing that is accomplished is the fine disintegration of the bacterial cell. The basic substance discovered and named typhotoxin by Brieger and the toxalbumin of the same author are not bacterial toxins.

The cholera bacillus has been investigated by a large number of experimenters with diverse and in some instances with contradictory results. Undoubtedly it is true that this organism contains an intracellular toxin, traces of which have been extracted in various ways, and with this a slight degree of immunity has been secured. For instance, Conradi has submitted this organism to long continued aseptic autolysis and has obtained by this method traces of a toxin.

The pest bacillus forms an intracellular toxin, but apparently the bacillus itself easily undergoes disintegration and the toxin readily passes into solution. For instance, Markl found that the cell substance when life was destroyed by chloroform was very toxic, but that the filtrates of cultures were not highly active unless old cultures were employed. The minimum lethal dose of the most potent poison obtained was found to be for mice 0.005 cc. A pest antitoxin has been prepared — indeed, there are several preparations of this substance, differing more or less in method of preparation and in potency. The pest antitoxin of Yersin, made by treating horses with gradually increased doses of dead cultures, undoubtedly has curative value in the treatment of the disease.

The presence of a toxin within the cell of the gonococcus has been demonstrated. If a culture of this organism two days old be filtered through porcelain and the filtrate injected into mice, but little or no effect results, while if a culture from two to three weeks old be treated in the same way the filtrate is found to be toxic. This shows that the toxin is contained within the cell and becomes active only after the disintegration of the organism. Wassermann obtained some preparations, 0.1 cc of which were sufficient to kill mice. Gonotoxin is a fairly stable body. It can be precipitated with absolute alcohol and can be heated to 180° without marked loss of toxicity. While none of the lower animals are susceptible to infection with this micro-organism, rabbits, mice and guinea pigs are readily affected by the toxin. Attempts have been made to produce an antitoxin for this poison, but without any marked success. It is true that Christmas has reported the preparation of an active serum by immunizing goats, but the action of this antitoxin is very slight, and Wassermann's results have been wholly negative.

Cultures of the pneumococcus, the cause of croupous pneumonia, have been found to be slightly toxic. From the heart's blood of rabbits treated with this germ Isaeff extracted a poison which killed animals and with which he was able to secure a slight degree of immunity.

The tubercle bacillus elaborates a potent poison, which has been studied under the name of tuberculin. Up to the present time, however, there is no reason for believing that this organism produces any toxin. Tuberculin is a poison, but not a toxin — that is, animals cannot be immunized to it, nor can an antitoxin be prepared from it.

It is especially desirable that we should know something about the toxin of the anthrax bacillus, because this organism has been taken as the type of infectious bacteria, and until its toxin is isolated and studied it will be difficult to formulate any theory concerning the action of pathogenic germs that will not be open to criticism. A few years ago Conradi after an apparently exhaustive research on this subject came to the following conclusion: "By no method known at present can it be shown that the anthrax bacillus forms either an extracellular or an intracellular poison in the animal body. Indeed, these experiments increase the probability that the anthrax bacillus does not form any poisonous substance. Therefore the solution of the manner in which anthrax infection results remains unknown. Whether improved chemical methods will lead to the detection of a poison or not, cannot be determined, but for the present the anthrax bacillus must be regarded as a purely infectious organism." This conclusion certainly is not true, as has been shown by recent work in the writer's laboratory, where the anthrax bacillus has been broken up and a highly active toxin obtained and animals immunized to this toxin.

Many — possibly all — of the pathogenic bacteria produce what may be called secondary toxins. These bodies — also designated as lysins — have a solvent action upon the red blood corpuscles. Animals may be immunized to the lysins, and the blood serum of immunized animals prevent the action of the lysin on blood corpuscles in the test tube. Tetanolysin is found in cultures of the tetanus bacillus along with tetanospasmin, or the specific toxin. The corpuscles of different species of animals vary markedly in their susceptibility to this lysin. Tetanolysin is a highly unstable substance. Even at room temperature and in dilute solution it often decreases markedly in its potency within a few hours. It is completely destroyed by a temperature of 70° C., and is markedly weakened at 50° C. There appears to be no constant relation between the amounts of tetanospasmin and tetanolysin in cultures of the tetanus bacillus. Sometimes one is present in large amount while the other is deficient, or both may be present in either small or large quantity.

Pyocyanolysin is found in small amount in cultures of the bacillus pyocyaneus. In young cultures it is apparently present only in the cell

substance, but in cultures from three to four weeks old the lysin can be detected in the filtrate after removal of the germ.

Colilysin, or the lysin of the bacillus coli communis, is thermostable, bearing a temperature of 120° C. for one half hour without decrease in its potency. Recent experiments in the writer's laboratory show most convincingly that in case of the typhoid, colon and anthrax bacilli at least, the lysin is a constituent of the bacterial cell. When the cell substance is broken up by means of sodium alcoholate, the lysin can be separated from other constituents, and its action on red blood corpuscles demonstrated in the test tube.

The actions of toxins on the animal body will be best understood by a brief statement of the following theories:

1. The bio-chemical theory of Ehrlich:—Ehrlich teaches that certain cells of the animal body consist of nuclei, which he designates as "special executive centres," from which there radiate many side chains. It must be understood that this is a chemical and not a morphological conception of the cell. Physiologically these side chains are concerned in processes of nutrition. Nutritive substances brought to the cells by blood or lymph can be utilized only after they have entered into combination with one or more of these side chains. It is possible that some of these side chains combine with carbohydrates, others seize upon proteids, while others fasten themselves to molecules of fat. In this way all serve in securing nutritive material for the growth, repair, or reproduction of the cell. It is also probable that certain pharmacological agents act upon the different tissues of the body by virtue of combinations effected with these cellular side chains. In order for any substance to be poisonous to a given animal, there must be in the body of that animal, cells with side chains capable of combining with the substance. A body which is unable to effect a combination with any animal tissue cannot be

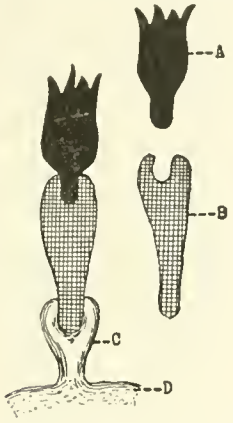


FIG. 1.
A, complement; B, intermediary body; C, receptor; part of cell.

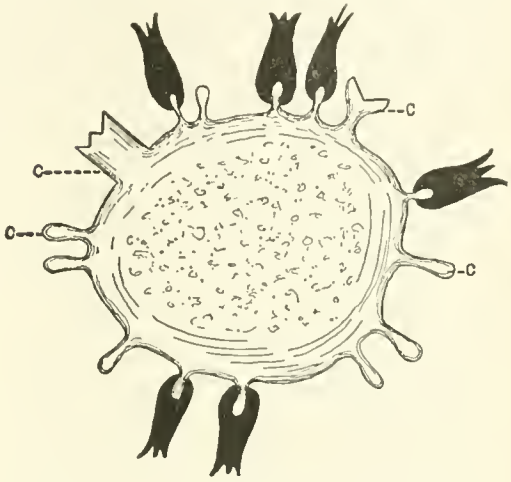


FIG. 2.
Cell with different kinds of receptors. C, receptor.

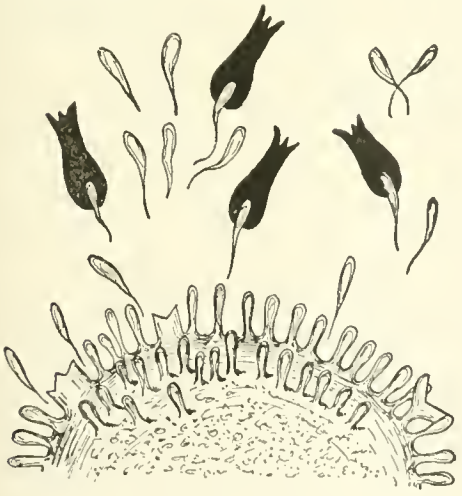


FIG. 3.
Showing separation of antitoxins, and combination of toxins with free antitoxins.

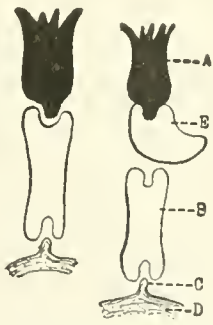


FIG. 4.
Showing the action of anti-complement. A, complement; B, intermediary body; C, receptor; D, cell; E, anti-complement.

PLATE I.

poisonous. It is not supposed that cells possess side chains especially provided for the purpose of combining with poisons, but it is possible that certain atomic groups which ordinarily are concerned in securing nutritive material for the cell may combine with substances which are capable of bringing about cellular destruction. On account of the close chemical resemblance between the bacterial toxins and certain food principles, notably those proteid in character, this supposition seems quite plausible. In the first place then we may say that the body cells must possess toxophile side chains. By this it is meant that in the molecular construction of certain constituents of the cell there are groups of atoms which can combine with bacterial toxins. On the other hand a given substance in order to be toxic must possess certain cytophile side chains. Both the toxophile groups of the cell and the cytophile groups of the toxin may be designated as haptophorous bodies. By this it is meant that by virtue of these groups the toxin enters into combination with certain molecules within the cell. However, the toxin is possessed not only of a haptophorous, but also of a toxophorous group, and it is by virtue of the latter that injury to the cell may be accomplished. According to this theory, ordinary nutritive products must possess cytophile haptophorous side chains, but do not contain the toxophorous group. When a small amount of a bacterial toxin is introduced into the body of a susceptible animal, by virtue of its haptophorous group it combines with some cell in the body. Whether or not it causes destruction of that cell depends upon the immediate injury done by this combination. If the toxin be introduced in quantity sufficiently large it may completely destroy the cell, and if a sufficient number of cells be destroyed, death results. If, on the other hand the amount of toxin introduced be nonlethal, and the number of toxophile groups in the cell used up in the combination be also small, the cell soon recovers from the injury done it, but recovers deprived of the constituent side chain which has combined with the toxin. Feeling this loss, and needing this side chain in order to supply itself with nutritive material, the cell throws out a new side chain, and when stimulated by frequent introduction of small quantities of toxin, it finally not only makes good the loss with which it has met, but throws out more side chains than it can possibly use. The over-stimulated cell secretes, as it were, toxophile groups and as frequently happens in case of tissue stimulation, the process continues to a point of over compensation. The excess of toxophile groups thrown out by the cell becomes so great that some of them are cast off into the blood, lymph and other fluids of the body and thus constitute the antitoxin. If the toxin be introduced into the body of an animal whose blood and lymph are filled with detached toxophile groups, the toxin is neutralized by these detached side chains and the cell escapes injury wholly. It is in this way that Ehrlich accounts for the formation of antitoxins and the production of toxin immunity. If the blood serum of an immunized animal be injected into a non-immune animal and the latter be treated with the homologous toxin the poison thus introduced combines with the antitoxin dissolved in the body juices, and the cells of the animal thus treated wholly escape any injurious effect. Ehrlich makes the following statement on this subject: "The theory above developed allows of an easy and natural explanation of the origin of antitoxins. In keeping with what has already been said, the first stage in the toxic action must be regarded as being the union of the toxin by means of its haptophorous group to certain side chains of the cell protoplasm. This union is, as animal experiments with a great number of toxins show, a firm and enduring one. The side chain involved, so long as the union lasts, cannot exercise its normal nutritive physiological function — the taking up of definite food-stuffs. It is, as it were, shut out from participating, in a physiological sense, in the life of the cell. We are, therefore, now concerned with a defect which, according to the principles so ably worked out by Prof. Carl Weigert, is repaired by regeneration. These principles, in fact, constitute the leading conception in my theory. If, after union has taken place, new quantities of toxin are administered at suitable intervals and in suitable quantities,

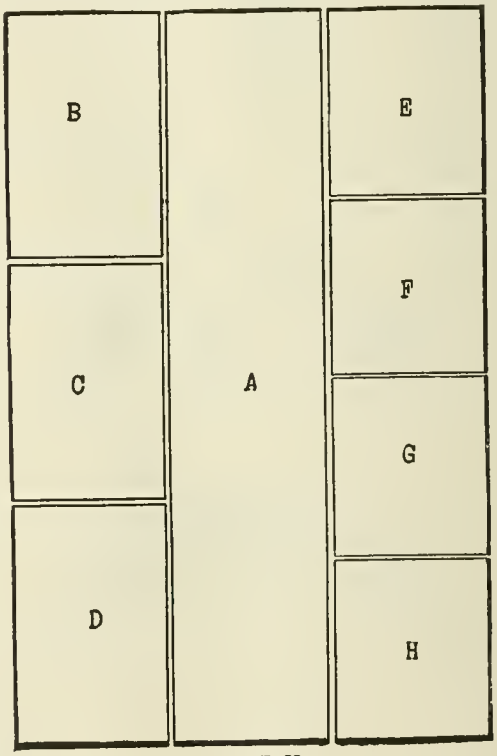
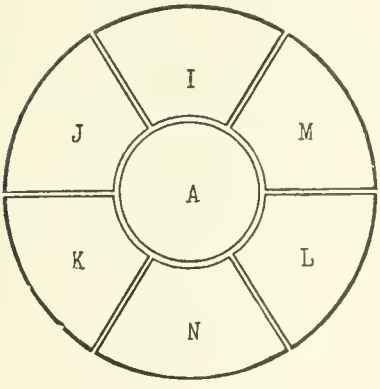


PLATE II.

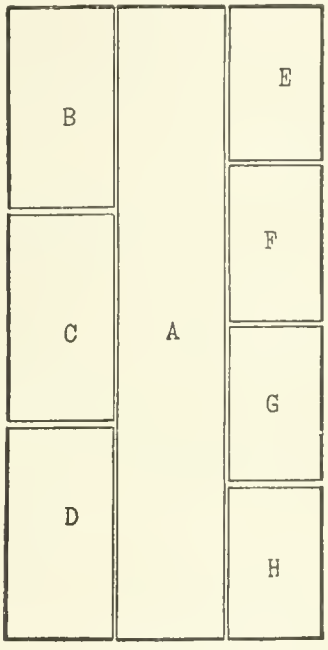
A = Nuclein group. E = Toxic group.
B = Amido group. F = Hemolytic group.
C = Di-amido group. G = Hemoglobin splitting group.
D = Mon-amido group. H = Carbohydrate group.

the side chains which have been reproduced by the regenerative process are taken up anew into union with the toxin and so again the process of regeneration gives rise to the formation of fresh side chains. In the course of the progress of typical systemic immunization, as this is practised in the case of diphtheria and tetanus toxin especially, the cells become, so to say, educated or trained to reproduce the necessary side chains

in ever-increasing quantities. As Weigert has confirmed by many examples, this, however, does not take place as a simple replacement of the defect. The compensation proceeds far beyond the necessary limit; indeed, over-compensation is the rule. Thus the lasting and ever-increasing regeneration must finally reach a stage at which such an excess of side chains are present in too great a quantity for the cell to carry, and are, after the manner of a secretion, handed over as needless ballast to the blood. Regarded in accordance with this conception, the antitoxins represent nothing more than side chains reproduced in excess during regeneration, and therefore pushed off from the protoplasm, and so coming to exist in a free state. With this explanation, the phenomena of antitoxin formation lose all their strange, one might say, miraculous characters."



Body Cell.



Bacillus.

PLATE III.

According to Ehrlich's nomenclature, the cell side chain is known as the receptor. The haptophorous group of the toxin has been designated at different times and by different persons as immune body, intermediary body, and amboceptor. The toxophorous group of the toxin is generally known as the complement. A toxoid is a toxin whose toxophorous group has been destroyed, but whose haptophorous group still remains intact and capable of combining with the cell receptor. Plate I. is taken from 'Cellular Toxins,' and will aid in an understanding of Ehrlich's theory.

2. The chemical theory of the writer: This theory, which has been worked out for the colon bacillus, may be summarized as follows:

(1) The colon bacillus is in its essential part a chemical compound as surely as sodium sulphate or phenyl hydrazin.

(2) The colon bacillus is a chemical compound in whose molecule we have demonstrated the existence of the following groups: nuclein, amido, di-amido, mon-amido, carbohydrate, toxic, hemolytic, and hemoglobin-splitting. Graphically we may represent the colon molecule as in Plate II.

There may be, and probably are, many other groups; then, each of these may, and probably does, contain sub-groups. Besides, these groups are attached to one another to form a highly complex molecule, and the lines along which the molecule splits up depend upon the kind and the amount of the energy applied. The force with which these groups are held in the molecular whole varies in strength, consequently some groups are easily split off while others are separated only under the influence of a relatively powerful agent. The toxic group in the molecule of some pathogenic bacteria drops off in the presence of moisture and at a temperature of 37° C. This is true of those germs, such as the bacilli of tetanus and diphtheria, that are said to form soluble toxins. Many germs also have hemolytic groups that become detached from the molecule under similar conditions. Some of the groups in the bacterial molecule are essential to the vitality of the cell. Such I suppose to be the case with the nuclein group, while others are not essential. The latter is probably true of the toxic group in certain bacteria, and this explains the fact that most pathogenic bacteria can be attenuated by growth in certain media, or under certain unusual conditions of temperature.

(3) Every cell in the animal body contains complex molecules similar to those of the bacillus.

(4) The reaction of the colon molecule and a body molecule or cell is chemical, just as much so as that between sulphuric acid and calcium carbonate. When these two molecules

are brought within the range of chemical attraction, if the chemism between a group in the one and a group in the other is greater than that which holds these groups in their respective molecules, a reaction takes place. Each group is split off from its molecular combination, and the two combine to form a new molecule; and the injury done the bacillus or the cell depends upon the group that has been abstracted. No bacillus molecule can do the body cell harm unless such a reaction takes place. It follows also that a toxin split off from a bacterial molecule and injected in the free state into an animal does harm, or breaks down the body molecules more promptly than when the unbroken bacillus is introduced; as sodium chloride is not a poison, but if it be broken up into its constituent base and acid, either of these when introduced into the body destroys the first cells with which it comes in contact.

(5) The reaction between bacillus and cell resulting in the formation of antitoxin may be illustrated in Plate III.

Suppose that the chemical attraction between group e in the bacillus molecule and group m in the cell molecule, is greater than that which holds these groups in their respective molecules, then these groups will be broken away from their molecules and unite to form a new molecule; which being saturated and stable, is not harmful. The injury done to the cell will depend upon the importance that group m bears to the functioning power of the cell, and the injury done to the animal depends upon the number of cells whose physiological function is thus interrupted. The cell which has been injured, by virtue of its chemical attraction, repairs its loss by splitting off from the nutritive substances within the range of its chemism groups of m, and in doing this it splits off more m's than it can use, and the excess becomes the antitoxin of the blood serum. With this conception it is easily understood why the number of antitoxins that may be formed is practically unlimited and why each is specific. As group e in no two kinds of bacterial cells is identical, so the group split off from the body cell will not be identical.

VICTOR C. VAUGHAN,
Dean Department Medicine and Surgery, University of Michigan.

Tox'odon, a genus of large Pleistocene mammals whose complete remains are found in the Pampas formations of Argentina. They were about the size of a hippopotamus; the teeth consist of large incisors, very small lower canines, and strongly-curved molars, all with persistent roots. According to Cope, the tarsal bones more nearly resemble those of the *Proboscidea* than any other known ungulates. With a smaller genus, *Nesodon,* it constitutes the sub-order *Toxodontia.*

Toy, Crawford Howell, American Oriental scholar: b. Norfolk, Va., 23 March 1836. He was graduated at the University of Virginia in 1856, studied in Berlin (1866–8), and became professor of Hebrew in the Southern Baptist Theological Seminary in 1869, and professor of Hebrew and Oriental languages and lecturer on biblical literature at Harvard in 1879. His published works include: 'The Religion of Israel' (1882); 'Quotations from the Old Testament in the New Testament' (1884); 'Judaism and Christianity, a Sketch of the Progress of Thought from Old Testament to New Testament' (1890); 'Hebrew Text and English Translation of Ezekiel' (1899); 'Commentary on Proverbs' (1899); and others.

Toyama, tō-yä-mä', Japan, the capital of the prefecture of Toyama, situated near the head of Toyama Bay, west coast of central Hondo, 170 miles northwest of Tokyo. It has considerable trade in drugs and leather. Pop. (1899) 59,588.

Toynbee, toin'bē, **Arnold,** English social economist and philosopher: b. London 23 Aug. 1852; d. Wimbledon 9 March 1883. He was interested in various movements of popular reform and the betterment of the laboring classes. Though called a socialist, he was certainly a conservative one, and vigorously opposed in two lectures the doctrines of the 'Progress and Poverty' (1880) of Henry George (q.v.). Toynbee Hall in Whitechapel, London, was established in his memory in January, 1885, and was the first "university settlement." His writings were posthumously collected as 'The Industrial Revolution' (1884; 4th enlarged ed., 1894). Consult: Montague, 'Life' (Johns Hopkins historical series, 1889); Milner, 'Arnold Toynbee: a Reminiscence' (1895).

Toynbee, Paget, English critic and author: b. Wimbledon 20 Jan. 1855. He was educated at Balliol College, Oxford, and from 1878 to 1892 was a private tutor. An Italian scholar, he has been a contributor to 'Romania' and the 'Giornale Storico della Letteratura Italiana,' and published: 'Index of Proper Names in the Works of Dante' (1894, 1897); 'Dictionary of Proper Names and Notable Matters in the Works of Dante' (1898); 'Ricerche e Note Dantesche' (1899); 'A Critical Text of the Divine Comedy' (1899); besides editions of the three parts of Cary's 'Vision of Dante,' with introductions and notes (1899, 1901, 1902); a 'Life of Dante' (1900; 2d ed., 1901); and 'Dante Studies and Researches' (1902).

Toys, American, Manufacture of. To tell the story of the art of toy making from its earliest days it would be necessary to follow the industry back through many centuries, for the archæologists, in delving among the tombs of ancient Greece and Egypt have made the surprising discovery that children played with dolls — and jointed dolls, at that — more than 5,000 years ago. Moreover, by the side of these dolls the scientists have unearthed other playthings that children still crave: dolls' furniture, the utensils for cooking and for keeping shop, and, what is perhaps more interesting from the point of view of the antiquarian, the articles used by the priests in the making of sacrifices, cleverly duplicated in miniature, showing that the children of those times also played at having religious exercises for the benefit of their dolls.

Scientists now claim that the custom of playing with dolls is one that is practically as old as the world itself, and they base their assumption upon the theory that playthings are and always have been just as necessary a constituent of human health and development as either food or medicine. The most eminent modern psychologists support this theory. They claim that the reason why children crave toys is that their nature requires them, and

that to deprive them of such playthings would be to retard their mental growth and development.

In spite of the early origin of toys the progress in the manufacture of playthings was so slow that, even as late as 100 years ago they were few in number, simple of construction, and extremely costly, especially in the United States. At that time no such articles were made in this country, and, as the cost of importation added materially to the price, there were comparatively few persons who were financially able to purchase such puppets for their little ones. Instead, the children of those days accepted more primitive playthings — dolls that were often not dolls at all, but pieces of cloth, either folded and pinned in such manner as to suggest the "shape" that was not there, or with head and bust stuffed hard with sawdust, the features being indicated by pen and ink drawing. In addition to these dolls there were a few other toys that could be purchased for children, but hoops, jumping-ropes, ten-pins, marbles, pop-guns, the jack-in-the-box, the battledoor and shuttlecock, a few simple games, some roughly illustrated books, alphabet blocks, etc., represented the limit of the toy-sellers' stock.

So far as America is concerned the toy-making industry is of so recent an origin that it can scarcely be said to have a history. Less than fifteen years ago more than 90 per cent of the toys sold in this country were of foreign manufacture, and we made no attempt to export such few articles as we did make into other countries. To-day, on the other hand, scarcely more than 25 per cent of the toys we sell are made abroad, the total amount being less than $5,000,000 in 1905, while our exports are increasing so rapidly year by year that it will not be long before they attain the $1,000,000 mark. The only hold that the foreign manufacturer has upon the American market at the present time is due to the fact that he can make the cheaper grades of toys at so low a price that he can sell them to us for less than we can make them. So far as ingenuity and skill are concerned he has at no time been able to keep pace with us, for the wooden jointed doll that was so popular a few years ago, and the crude mechanical toys that delighted the hearts of the children of the last generation, have given place to that domestic invention, the unbreakable doll, which was first made in Brooklyn, N. Y., and the cast steel toy which is so perfect in its mechanism.

To obtain anything like an accurate idea of the great progress that this nation has made in the art of toy-making it is necessary to remember that up to ten years ago there was not a doll factory in the United States, and that such other toys as were manufactured in American turning mills were cheap in quality and unprepossessing in appearance. To-day practically the only toy that is not made successfully in this country is the so-called "French bisque" doll, which we still import from Bavaria. So far as other toys are concerned the products of American industry are so far superior to any goods that we can import that our demands upon the toy-makers are decreasing steadily every year.

When the American manufacturers began to make toys, about a quarter of a century ago, they found that it would be extremely difficult for them to compete successfully with the foreign toy-makers in the field which they had occupied for so long. In the first place material was cheaper in Europe, and there could be no comparison between the comparatively good wages paid to workmen in this country and the miserable pittance allowed in those German and Swiss villages where the entire population was held under contract to produce such goods at prices that barely enabled them to keep body and soul together. To overcome this difficulty American inventive genius was called into play, with the result that the local manufacturers not only established many new lines of toy specialties but that they evolved countless ingenious contrivances that the foreign producer has never dreamed of making. Thus while we still import some dainty toys from France, Germany, and Switzerland, nearly all the newest and most unique productions are now made in America.

According to the statistics collected for the 1900 census there are no less than 170 establishments in the United States in which toys are now made. Of these, 49 are located in New York State, 23 in Massachusetts, 18 in Pennsylvania, 16 in Ohio, 13 in Illinois, and 11 in New Jersey, while the remaining 40 are distributed among no less than 15 different States. The amount of capital invested in this business in 1900 was reported to be $3,289,445; the cost of material was said to aggregate $1,668,199, while the total value of the goods produced by these manufacturers was $4,024,999. The number of persons employed in these establishments was 3,330, while the wages paid aggregated $1,123,593.

Another industry that is closely allied to that of toy-making is that of the manufacture of the tinsel decorations which are used upon Christmas trees and for other ornamental purposes at that time of the year. While it is true that a great many of these articles are still imported from Germany, the largest part of these tinsel novelties and trimmings used in this country are made in Philadelphia, there being one establishment alone in that city which has an annual output of 15,000,000 tinsel ornaments, and 2,500,000 paper dolls — fairies, Santas, etc.— for the decoration of Christmas trees. From the Philadelphia workshops these goods are shipped to every State in the Union as well as to Canada, Mexico, Cuba, and South America. During the past few years there has also been an indication of an import trade with Europe.

Trabue, trā'bū, **Isaac**, American lawyer: b. Russell County, Ky., 25 March 1829. He was educated at the Western Military Institute, Georgetown, Ky., and was graduated at the Law School of Transylvania University, Lexington, Ky., in 1854. At the outbreak of the Civil War he recruited a company for the Union army and served through the war as captain and as colonel. He was an extensive slave-owner, and at the beginning of the war he sent his male slaves to serve in the commissary department, while the women went as nurses to the hospitals. He is well known as a chess-player, and in 1883 defeated Zuckertort,

the champion of the world. He compiled a code of laws governing four-handed chess, and was for three years editor of the chess department in the Louisville 'Sunday Argus.' He founded the town of Trabue, now Punta Gorda), Fla., and is extensively engaged in the orange raising industry in that State. He has written a novel, 'Black Wench,' and a drama, 'Hobson Blowing up the Merrimac in Santiago Bay.'

Tracery, in architecture, the ornamental stone-work in the head of a Gothic window, arising from the mullions, and presenting various combinations of curved or straight lines.

Trachea, trā-kē'a or trā'kę-a, or **Windpipe**, the principal air-passage of the body; a tube extending from the larynx to a point opposite the third dorsal vertebra, where the tube divides into two chief divisions or bronchi, one of which supplies each lung with the air necessary for respiration or breathing. The trachea is of cylindrical form, and is both membranous and cartilaginous in its structure. Its length is about 4½ inches, and its diameter from ¾ inch to 1 inch; that of the male being larger than that of the female. The front, or anterior surface of the organ, is convex, and is covered in the neck and chest by various structures, including the isthmus of the thyroid gland, the inferior thyroid veins, the sternohyoid and sternothyroid muscles, the first part of the sternum, the arch of the aorta, etc. The trachea rests on the gullet or œsophagus, while in the chest it is situated between the pleuræ or membranes lining the thorax, and has the pneumogastric nerve on each side. The trachea is composed of rings or zones of gristly or cartilaginous nature, known as the cartilages of the trachea rests on the gullet or œsophagus, while each cartilage forms an imperfect ring, being unclosed behind, and having the gristly edges merely joined by fibrous membrane. The cartilages are separated from each other, and also connected together, by narrow bands of fibrous tissue. The first cartilage of the trachea is broader than the others, and may be divided at one extremity, while the last cartilage is thick in the middle, and curved backward at the point where the trachea divides into the two bronchi. Sometimes two of the cartilages may unite. The muscular fibres of the trachea exist in longitudinal and transverse layers, and are composed of unstriped or non-striated fibres. (See Muscular System.) The trachea itself is lined by delicate mucous membrane, which is covered by epithelial cells provided with delicate vibratile processes or cilia. The trachea derives its blood from the inferior thyroid arteries. Its nerves arise from the pneumogastric trunks and recurrent branches, as well as from the sympathetic system. Foreign bodies falling into the trachea most frequently enter the right bronchus, because of the larger size of the latter, and because of the more oblique position of the left bronchus.

Diseases and Injuries of the Trachea.— The trachea is liable to inflammation and its products, and frequently suffers from extension of disease from the larynx. Acute inflammation may occur as an idiopathic affection, or a symptom of other disease, as smallpox, measles, typhus, tuberculosis, croup, etc. The symptoms are pain in the windpipe from the top of the sternum, expectoration of mucus, sometimes in regular rings, and a peculiar brazen-like cough. Chronic inflammation usually accompanies follicular pharyngo-laryngitis, tuberculosis, and syphilis, and may extend to the submucous tissues and the cartilaginous structures, resulting in ulceration, cicatrization, and stricture. The treatment consists in rest, the application of warm poultices, the inhalation of steam impregnated with balsamic or anodyne substances, and the administration of antiphlogistic remedies. Constriction of the trachea may be produced by aneurismal or other tumors pressing externally on the trachea; or the symptoms may be produced by pressure on the nervous trunk, or the inferior laryngeal fibres. Foreign bodies occasionally pass through the larynx into the trachea, and the accident is a formidable one, which not unfrequently proves fatal. The accident occurs most frequently among children, and is caused by a sudden inhalation while holding something in the mouth. Occasionally, however, a foreign body may, during the act of swallowing and without an inhalation, pass under the epiglottis and into the upper part of the larynx. Foreign bodies in the windpipe may be arrested above the rima glottidis, between the vocal cords, in the cavity of the larynx, or in the trachea. In such cases the patient is suddenly seized with convulsive cough and dyspnœa. The speech is more or less affected, and the breathing is whistling or stridulous; but the diagnosis rests mainly on the sudden accession of the symptoms. When the presence of a foreign body is made out, it ought to be removed at once. When the body is loose in the trachea, a free opening lower down should be at once made, and the opening may be either longitudinal or transversely valvular. It is advisable in nearly all cases to open the trachea, as, by securing a free aperture for respiration, spasm of the glottis is obviated, and the foreign body may be removed through the artificial opening, or it may fall through the glottis into the mouth. Fracture of the trachea occurs from direct violence, and in such cases the wounded part should be laid freely open, so as to secure the passage of air to the lungs. Union of the wound by suture is to be avoided, that by suppurative inflammation being preferable, the head and neck being retained in a suitable position. Foreign bodies in the trachea, and all kinds of injury from external violence, are serious affections, as disease of the lungs is apt to be induced.

The term trachea as applied in respect to invertebrates connotes a more or less complicated arrangement of air-tubes and spiracles (q.v.), most fully developed in insects, and constituting the respiratory system. See Insects. For the general subject, see Anatomy; Lungs; Nose and Throat; Respiration.

Tracheot'omy. See Nose and Throat.

Tracho'ma. See Ophthalmia.

Trachyte, trā'kīt, an igneous or pyrogenic rock of the effusive type, and consisting of a ground mass of slender hair-like crystals of orthoelastic feldspar and ferro-magnesian silicates (hornblende or augite), and generally phenocrysts of sanidine feldspar. It differs from rhyolite chiefly in the absence of quartz. Tra-

chyte occurs in the Black Hills, in Custer County, Colo., in Montana, along the river Rhine, where the Drachenfels furnishes the most typical variety, in the Auvergne, in Italy, and in the Azores. The compact pre-Tertiary varieties are classed as felsites (q.v.) or as porphyries.

Tracing Paper, transparent paper which enables a drawing or print to be clearly seen through it when laid on the drawing, so that a pen or pencil may be used in tracing the outlines of the original. It is prepared from smooth unsized white paper rendered transparent by a varnish made of oil of turpentine with an equal part of Canada balsam, nut-oil, or other oleo-resin.

Tract Number 90. See TRACTS FOR THE TIMES.

Tract Societies. The circulation of religious appeals in writing preceded the invention of printing, and was used by Wyclif and other reformers at times and places when and where open preaching might have been too perilous. The printing-press made it possible to multiply such appeals, and it was largely used for this purpose in the religious controversies of the 16th and 17th centuries. The 17th century and the beginning of the 18th witnessed the organization of several societies within the Church of England for promoting Christian knowledge, and "the dispersion both at home and abroad of Bibles and tracts of religion." It was not, however, until 1750 that members of different Protestant denominations united in London to form the "Society for Promoting Religious Knowledge Among the Poor." This and other societies with a similar object circulated many religious books and tracts.

In the United States the Methodist Book Concern, established in Philadelphia, issued its first publication in 1789, and removed to New York in 1804. In 1822 a bindery was established, and in 1824 a printing office was added. The division of the Methodist Church on the slavery issue led to the establishment of a separate book concern at Nashville, Tenn., by the Methodist Episcopal Church South. The publications of the Book Concern are of three classes — first, the bound volumes, denominational papers, and some pamphlets; second, those of the Methodist Episcopal Sunday School Union; and third, those of the Methodist Episcopal Tract Society. The salaries of bishops and other expenses of the Methodist Episcopal Church are paid out of the profits of the Book Concern.

The American Tract Society was founded in the spring of 1825. In this society Christians of various Protestant denominations united to publish and circulate "whatever would best diffuse a knoweldge of our Lord Jesus Christ as the redeemer of sinners, and promote the interests of vital godliness and sound morality," the material circulated to be such as would receive the approbation of all evangelical Christians. The society established a system of colportage, gave wide circulation to tracts, and sought to place Christian literature in every family. Periodicals were established for young and old, and the needs of the large foreign population were met by religious publications in their own languages. The society has contributed from its earnings over $750,000 to assist missionaries abroad in printing books approved by the society. In donations and legacies the society has received over $6,000,000, and has expended that amount in its gratuitous work, besides making sales amounting to over $13,000,000. Among the nationalities reached in their own languages by publications of the American Tract Society, are the German, Swedish, Danish, French, Spanish, Dutch, Italian, Portuguese, Polish, Bohemian, Hebrew, German-Hebrew, Hungarian, Lithuanian, Finnish, Welsh, and Armenian. Besides the American Tract Society, every important denomination has an organization for the circulation of its denominational literature.

Tracta'rianism, the name usually given to a system of religious opinion and practice promulgated within the Church of England in a series of papers published under the title of 'Tracts for the Times,' between September 1833 and March 1841. The immediate object of the writers seems to have been to rouse a large number of nominal adherents of the Church of England from their apathy, by awakening their interest in what the writers conceived to be the distinctive principles of that Church. For this end they sought to mark out a middle way between "Romanism" and what they called ultra-Protestantism. The leaders in this movement were J. H. Newman, John Keble, and E. B. Pusey, and they were assisted by not a few devoted adherents, such as R. H. Froude (brother of the historian), Hook, Palmer, Perseval, Isaac Williams, and others. In the first stage of the movement little else was attempted than the inculcation of the peculiar and exclusive powers of ministers episcopally ordained by the laying on of hands in a direct and unbroken line from the apostles; and it was not till the publication in 1838 of the 'Remains' of R. H. Froude, under the joint-editorship of Newman and Keble, that any suspicion was created in the public mind of the ultimate tendencies of the movement. The volumes published under that title were pervaded by an unmistakably anti-Protestant spirit, and the fact of their being edited and defended (as they afterward were) by two who were known to be leaders in the Tractarian movement caused that movement to be denounced by many who had hitherto treated it with indifference or forbearance, or had even bestowed upon it a certain measure of approval. From that date the bishops commenced a series of charges all bearing more or less strongly against the authors of the tracts, and treating them not as heretics but as disturbers of the Church. Still the movement went on more actively than ever. A multitude of controversial writings appeared on both sides, and the tracts gradually showed more and more of a leaning to the Roman Catholic Church. At last, in Tract No. 90, written by Mr. Newman, and published in March 1841, an attempt was made to prove that there is no insurmountable barrier between the Roman Catholic and the Anglican communions; that the Thirty-nine Articles, although prepared by Protestants, are susceptible of a Catholic interpretation not inconsistent with the doctrines of the Council of Trent. On the 15th of the same month the hebdomadal board of the University of Oxford condemned the tract as teaching a mode of interpreting the Thirty-nine Articles

inconsistent with the statutes of the university, and the bishop of the diocese of Oxford recommended that the series of tracts should terminate with that number, which it did. A few years later (1845) Newman went over to the Church of Rome, as several of the other partakers in the movement had done before him. The effects of the movement can still be traced within the English Church in the extreme development of ritualism in a section of the High Church. See ENGLAND, CHURCH OF; NEWMAN, FRANCIS WILLIAM; PUSEY, EDWARD BOUVERIE; PUSEYISM; RITUAL.

Traction, Electric. The history of the development of electric traction follows closely that of other great technical developments,—starting with experiments on a small scale, having no practical outcome, followed by experiments on a larger scale, showing the physical possibility of the system, and finally using the experience so obtained in a successful, commercial application of the system to practical operating conditions. It was not until the invention and development of dynamo-electric machines made it possible to obtain electrical energy at a reasonable cost that the commercial application of electric traction became possible, and even after that, electric machinery had to be improved before electricity could compete with the existing means of traction. Among the first to study the problem seriously were Siemens, in Germany, and Edison, Field, Daft and Vandepoele in this country. Before 1884 a few roads had been built for exhibition purposes and from that time until 1888, although some small roads were equipped with a few cars, yet it had not been proved that electricity could be profitably substituted on tramways for cable or animal traction. In February of 1888 the Sprague Electric and Manufacturing Company finished the equipment of the tramways in Richmond, Va., with the Sprague Electric Railway system, and operated the road so successfully that railroad managers from other parts of the country were convinced that they had something to substitute for animal traction that would increase their facilities for transportation and decrease the cost of operation. From this time the development of electric roads in the United States has been rapid. At first horse tramways were electrically equipped, then cables were displaced by electric trolley roads, then the tramways were extended further to the suburbs and surrounding towns, and towns were connected by interurban roads equipped electrically, running at high speeds and offering a service impossible with steam locomotives. For city train service on elevated roads, the substitution of electricity has taken a longer time, as the steam locomotives were efficient and as the changes involved an expenditure which would not have been advisable unless decided advantages with respect to service and cost of operation were shown. In the last few years, however, these advantages have appeared so decided that practically all such roads of the United States have been equipped by electricity. For the heavier work demanded by trunk line traffic now carried on by steam locomotives electricity has made little or no inroad. It is true that the possibility of electric locomotives hauling heavy trains has been demonstrated by the 100-ton locomotives that haul the Baltimore and Ohio trains through the Baltimore tunnel, but with the methods of electrical distribution in vogue and the type of service required, it was only in special cases that electricity showed any advantage over steam for carrying on traffic. Since 1902, however, the development of the single-phase alternating current motor has, to a considerable extent, changed the condition of affairs, and it is probable that there will be a gradual displacement of steam on trunk lines.

Direct-current Railway Motors.— On all the electric roads in this country, and on a large proportion of those abroad, direct-current motors are used for traction. These motors are of the series type, and are usually connected to the axle through a single spur gearing. The characteristics of the direct-current series motor are admirably adapted to traction work. The speed is dependent upon the tractional effort, and the motor slows down when the tractional effort increases, having something of the effect of a variable speed gear; this is very important in practical railway work, for if the motors ran at a constant speed, the energy demanded on grades would be greatly exaggerated, and much larger motors would be required. It is also true that this type of motor gives a greater flexibility to the system, as far as speed is concerned, and this flexibility is important in practical operation. To show the difference between a series motor and a shunt motor, suppose the track resistance is 10 pounds per ton weight of the car; then if the speed were constant (as would be the case with a shunt motor), the power required on a five per cent grade would be 11 times as much as on a level,—air resistance being omitted,—while with a series motor it would be only three or four times as much.

It might be well to briefly trace the development of electric railroad motors in the United States. The motors used by Sprague in the equipment of the Richmond road had too small a capacity for the work required, and very often burned out. They were two-pole machines, of a rated capacity of 7.5 horse-power, and at first drove the axle through a single reduction gearing; the work, however, was so heavy that it was found necessary to change to a double reduction gearing, the teeth of the pinion stripping on the heaviest grades. These motors were unprotected from moisture and from the dust and dirt of the streets. The method of suspending the motor, and some of the details of the regulation, are still retained. The field magnets of the motor were sleeved on the axle, thus centring the armature on the axle, and allowing a satisfactory relation between the two. The first motors had a double commutator, which was soon abandoned, as it greatly increased commutator troubles, which were at that time serious. The brushes first used on these motors were of copper, and a number of forms were experimented on, it being necessary to reverse the motor without injuring the commutator. None of the experiments with copper brushes were successful, and it was not until the introduction of the carbon brush by the Thomson-Houston Company that the commutator difficulties were largely obviated.

Soon after the Sprague Company entered the railway field, the Thomson-Houston and Westinghouse Companies took up electric railway work, and greatly aided its development by

adding their immense resources to the resources of the Sprague Company. From this time the development of street railway apparatus was rapid. The first motors of all the companies used double reduction gearing, and one of the first improvements, after the introduction of the carbon brush, was the design of a comparatively slow speed motor which allowed a single reduction gearing to be used. The first motor of this kind was made by the Wenstrom Company, and within a short time other manufacturers were making slow speed motors,— some going so far as to attempt gearless motors; the latter, however, were not successful owing to their great weight and lack of efficiency at reasonable speed. Most of the slow speed motors that were made at this time were not thoroughly enclosed, their efficiency being such that a better ventilation than could be obtained by a totally enclosed machine was necessary. The machines were, as a rule, of the four-pole type, with parallel armature windings, requiring four brushes and causing, under certain conditions, unbalancing in the circuits that greatly increased the armature losses and decreased the efficiency. The next step in motor development was made by the Westinghouse Company in what they called their No. 3 motors, a machine much like those at present in use. It had four poles, each of them provided with a field coil, while the armature was provided with what is called a series winding, necessitating only two brushes and doing away with the unbalanced armature circuits of the earlier machines. This type, with the modifications suggested by experience, is the one used in this country at the present time, and almost universally used abroad. The efficiency of railway motors at the present time is much greater than that of the motors of 10 years ago, both because of the improved design, and of the fact that better material can be obtained. The field magnets are now made of steel, the pole pieces being built up of thin sheets of soft iron, while the iron laminations of the armature are of such a quality that the losses due to hysteresis and eddy currents are comparatively small.

Controllers.— The first method used for regulating railway motors was by inserting resistance in the circuit of the machine; this was modified and developed until, in the Richmond motors of the Sprague Company, the series-parallel system was used, combined with a variable resistance obtained by making different combinations of the coils into which the field windings of the machine were divided. On starting, and for slow speeds, the two motors were used in series, while for the higher speeds they were placed in parallel. This system was abandoned, and for some years a parallel system for operating two motors on a street car was used. One difficulty found in the early series-parallel control was the liability of the motors to slip when in series position. The slipping of one pair of wheels would allow the motor connected to these wheels to revolve at such a high speed that its counter-electromotive force would cut off the power from the other, and the car would not start. This difficulty, which always exists, but which is not of importance on ordinary roads, was further complicated by the electrical difficulties in the controller,— the method of control not being as efficient as that used at present. In the Sprague system, there was no resistance outside of the motors, but the motor fields were divided into a number of coils, and the relations of these coils were varied, giving first a high resistance and a very strong field for a given current, and afterward a comparatively low resistance and a comparatively weak field. The difficulty of this system lay in the fact that all the heating incidental to the low efficiency of the motors on starting, was liberated in the field; and, further, the inductance of the fields was greatest at the breaking of the circuit, when all the coils were in series. The Thomson-Houston Company modified this by placing a variable resistance directly in the motor circuit, the resistance being regulated by a movable contact arm, controlled by the motorman. This gave better results than the Sprague system, but it also lacked efficiency. In 1891 the General Electric Company brought out a series-parallel controller, similar in some respects to the early Sprague control, but differing from it in the fact that the regulating resistances were not obtained by variations of the different motor field windings, but by resistances outside of the motor. This system, with variations due to different conditions of operation, it still used, and gives excellent results. Perhaps the most important development in controller work was due to the introduction of the magnetic blow-out devised by Professor Elihu Thomson. This apparatus is so placed as to control the breaking of the circuits, and almost entirely eliminates the destructive effects of sparking, due to the breaking. The method of operation is as follows: At first the two motors are placed in series, the resistance being also in series with them; then the resistance is gradually cut out, until finally the motors are in series across the line with no outside resistance in their circuits. Then the resistance is again cut in, and one of the motors is short-circuited; the next operation cuts out the short-circuited motor, the next places it in parallel with the other motor, a large part of the resistance still being in series with them; the rest of the operations consist in cutting out the resistances until finally the motors are in parallel across the line. The shifting of the circuits, due to the various operations necessary for regulation, any cross circuiting is carefully guarded against by enclosing the different sections in compartments, while the necessary breaking of the circuits is performed in the field of the blow-out magnet,— which practically eliminates the destructive effect of sparking. A reversing switch, included in the controller, is separated from the regulating cylinder, and is interlocked so that it can be operated only when the current is off.

Multiple-unit System of Control.— In urban train service, where a number of cars are operated in one train, with frequent stops, the question of acceleration is of the utmost importance. In order to accelerate quickly, it is necessary to have a large margin of tractive effort on the train,— that is, it is necessary to have a large proportion of the total weight of the train on the driving wheels. When the question of displacing steam locomotives for elevated railway service first came up, and was attacked on the basis of using electric locomotives, the advantages of the latter were not apparent. There was, of course, some advantage in the matter of expense, but not enough to justify the expendi-

ture necessary to change from steam to electric service. Mr. Sprague devised a system by which a number of cars on a train could be equipped with electric motors and controlled from any one of the cars; this system he called the "multiple-unit" system. At first it was opposed by most of the manufacturing companies and by many electrical engineers. With his customary energy, however, Mr. Sprague worked his system out to a practical demonstration, and to-day all trains operated by electricity employ his fundamental methods. The advantages of this system are these: It gives a large proportion of the total weight of the train on the driving wheels, and at the same time distributes this weight over the whole length of the train. In the first place, this allows rapid acceleration without slipping of the wheels, and in the second place, it does not impose an undue strain on any elevated structure. It is also possible, of course, to change the number of units on a train without changing the relative weights of the driving mechanism and the car. It furthermore utilizes all the train space for the transportation of the passengers. Its disadvantages, compared with a single locomotive, lie in the fact that it necessitates a greater number of motors, thus adding to the cost of installation and repairs, and it greatly complicates the system of control. These disadvantages are not, however, of controlling importance, as is shown by the fact that it has been introduced on practically all urban trains. Since the first introduction of the system a number of modifications have been made, the most important of them being those of the General Electric and Westinghouse companies.

In the Sprague system, each car is equipped with a controlling device operated by a pilot motor, the motor being operated through a circuit controlled by the motorman. The system is to a considerable extent automatic, as the rate at which the different positions of the controller on each car are changed depends upon the flow of current into the motors, and is not determined by the motorman. This is an important feature of the apparatus, and makes the acceleration uniform, and at a rate to give the greatest efficiency. The General Electric method of control is somewhat different from this, each car having a master-controller, very much like the ordinary tramway controller,— the speed at which the current is cut into the motors being determined by the rate at which the motorman turns the handle of the controller. In the Westinghouse controller, the apparatus which supplies current to the motor is operated pneumatically, the valves of the pneumatic system being worked by magnets in a local circuit, which has as a source of energy a few storage batteries on each car, and is operated by a master-controller on each car of the train. This makes all the operations independent of the line current, and gives very positive and efficient action. In this system also the idea of automatic control, determined by the current flowing into the motors, is utilized.

Overhead Trolley System.— For collecting the current to run electric cars, a number of devices were used, until finally Sprague's success at Richmond fixed a type of collecting device that is still considered standard in this country and is largely used abroad. Until actually determined by experiments, it seemed impossible that a moving contact device could collect the current necessary to supply the energy to the cars without such destructive sparking and heating that it would be inoperative. In the first experiments on electric railroading, the current was collected from the rails; afterward it was collected through small carriages running on the overhead wire; and finally it developed into a rotating wheel having a contact on the underside of the trolley wire, and pressing against it by some spring arrangement. What is called a "bow" trolley was first used,— that is, a wire bent into the shape of a bow, pressing against the underside of the wire, but having no rolling contact. This is still used to a considerable extent abroad, and presents some advantages over the trolley wheel used in this country. A number of modifications of both of these systems have been devised and employed, but to-day they represent what might be called the standard type of construction. The overhead trolley wires, from which the current is collected, are usually of copper; they are either suspended from insulators fastened to a span wire between poles on the two sides of the track, or from brackets fastened to a pole and projecting over the track. In this country they are almost universally placed over the centre of the track, but abroad they are sometimes placed on the side of the road, the trolley being so constructed as to make a side-bearing contact.

Underground Trolleys.— From the earliest application of electricity to railways, attempts were made to do away with the overhead wires used in the ordinary trolley systems. Conduits having a slot through which a current-collecting device could pass were placed beside the tracks or between the rails; conductors were placed in these conduits and the collecting devices on the cars were made to bear against the conductors. At first the conduits were not large enough, not enough space was given for insulation, and the results were unsatisfactory. The first successful system to be installed was a tramway at Budapest, designed by the Siemens Company. Here the conduit was on the side of the track, the tram rail forming part of the slot. The conductor was supported from below by insulators and the system was constructed on a larger scale than had been previously employed,— the details were carefully worked out, and the road has operated successfully from the time of its installation. In the meantime, in this country, the necessity of some such system in the cities of New York and Washington, where overhead wires were not permitted, had forced the different electrical companies to take up seriously the question of conduit construction, with the result that successful systems were worked out for both Washington and New York, the systems being practically the same. The slot in these systems is in the middle of the track. The conduit is constructed as follows: Cast-iron yokes supporting the tram rail and slot rail are placed at intervals of five feet, the rails are attached to the yokes and the whole structure is blocked up in its proper position; then sheet steel is placed between the yokes, forming a tunnel of the proper dimensions, and concrete is packed around the yokes and the forms, supporting the structure in its proper position and forming a tunnel for the conductor rails. The steel forms are then taken out. The conductors are made of T-iron, held from above by porce-

lain insulators placed in cast-iron boxes along the track. The details of the different systems that have been installed vary, but the above is practically the standard type of construction. The current for the car is collected by means of what is known as the plow, which passes through the slot and has two cast-iron contact shoes held against the conductor rail by springs; the rail is supported on cross-rods on the car and has a wide limit of lateral motion. It is usual to place ducts beside the track, these ducts containing the feed wires that are connected at various intervals with the conducting rail. The use of the conduit system has not extended in the United States beyond the cities of Washington and New York, but it is largely used abroad in locations where overhead wires are not permitted. The cost of the installation of such a system is much greater than that of an ordinary overhead trolley system, but the cost of maintenance is not, as a rule, as great as that of the overhead system, and it avoids the objectionable appearance of the ordinary trolley wire.

The Generation and Distribution of Current. — In the earlier roads, and, in fact, in most of the roads now operated in this country, the current for the motors is obtained from direct-current machines, having a voltage of between 500 and 600 volts. These machines are, as a rule, compounded so that their voltage increases with an increase of load. There are two reasons for this: One is that the increased voltage compensates to a certain extent for the loss of voltage in the distributing system; the other, and most important reason, is that the strengthening of the field prevents the sparking that might otherwise be caused by the armature reactions. It is the custom to ground the negative side of the machines, and connect the trolley wires through what is called "feed wires" to the positive brushes. These feed wires are carried along the line, connected at intervals to the trolley wires, it being usually the custom to divide the road into sections and feed the different sections from different feed wires. At the voltage which has been adopted as the standard,—that is, from 500 to 600 volts,—the economical distribution when the service is heavy is limited, and if a direct-current system is to be employed for a large area, a number of stations must be installed. For this reason, when the distances are great, it is sometimes necessary to employ a high potential alternating system, reducing to a 500-volt continuous-current system at centres of distribution called sub-stations. On interurban lines, for instance, where the distances are great compared with the number of units in operation, this method becomes imperative, as otherwise the variations of load on the central station would be excessive, and the cost of power would be practically prohibitive. This method of operation may be described as follows: The central station, located at some point where the greatest economy of operation can be obtained, generates alternating currents at a high potential; these alternating currents are taken to the sub-stations, situated at reasonable distances from one another along the line, and are there changed to alternating currents of lower potential by means of transformers, and then converted into direct currents of the proper potential by means of rotary converters. In this way, a large area can be supplied from one central station, and a comparatively large number of units can be operated at one time from this station, thus giving conditions of maximum economy. On the sub-stations themselves, there is, of course, a fluctuating load, and it is the custom to install storage batteries in connection with the rotary converters to equalize the load; the battery storing energy when the load is light, and giving it out when the load is heavy. Abroad, where alternating current motors are used, it is the custom to generate the alternating current at a high potential, and reduce it to a reasonable potential by static transformers along the line.

The Return Circuit and Electrolysis. — In most of the overhead traction systems, the current passing through the motors goes through the wheels of the car to the rails, and then returns to the station, "bus bars" finally appearing at the negative brushes of the dynamos. When a system is operated in this way, the rails are bonded,—that is, two adjacent rails are connected by conductors securely attached to the rails, and giving a low resistance to the electric current. If the bonding is good, a considerable part of the current passes along the rails while a small portion strays through the earth to other conductors, such as water pipes and gas mains, using these as a return conductor. If the bonding is bad, however, a considerable portion of the return current is carried by the underground pipes, causing them at times serious injury. For this reason, and also because of the fact that low conductivity in a rail return causes loss of energy, it is of importance that the bonding of the rails should be as thoroughly perfected as possible; it should also be carefully inspected at intervals, as the bonds are liable to break and produce a high resistance between the adjoining rails, thus diverting a considerable amount of current to the underground pipes. The matter of the electrolysis (q.v.) of underground metallic structures received little attention during the first two or three years of electric railroad development; the effect, however, naturally increased with time and the development of the systems until the serious damage that occurred became evident, and means for preventing it was sought. These means, as a rule, consisted in connecting different points of the rail circuit to the negative bus-bars of the station, by return feeders, and in making metallic contacts between the rail and pipes at points where the current was leaving the pipes; also in metallically connecting the pipes near the station with the negative bus-bars. No electrolytic damage is done when the current leaves the pipe through a metallic conductor; it is only when the current passes from the pipe through an electrolyte, such as is furnished by moist soil, that corrosion takes place. In some places, the joints of the pipes have been insulated to prevent the current from passing through them, and this is perhaps the most efficient means of avoiding electrolytic troubles. It is impossible, in the short space of this article, to thoroughly discuss the question of electrolysis of underground structures due to the return current of electric roads; I think it may be stated, however, that by using a combination of the means stated above, the destructive effects can be reduced to a minimum, and made of little practical importance. On underground trolley

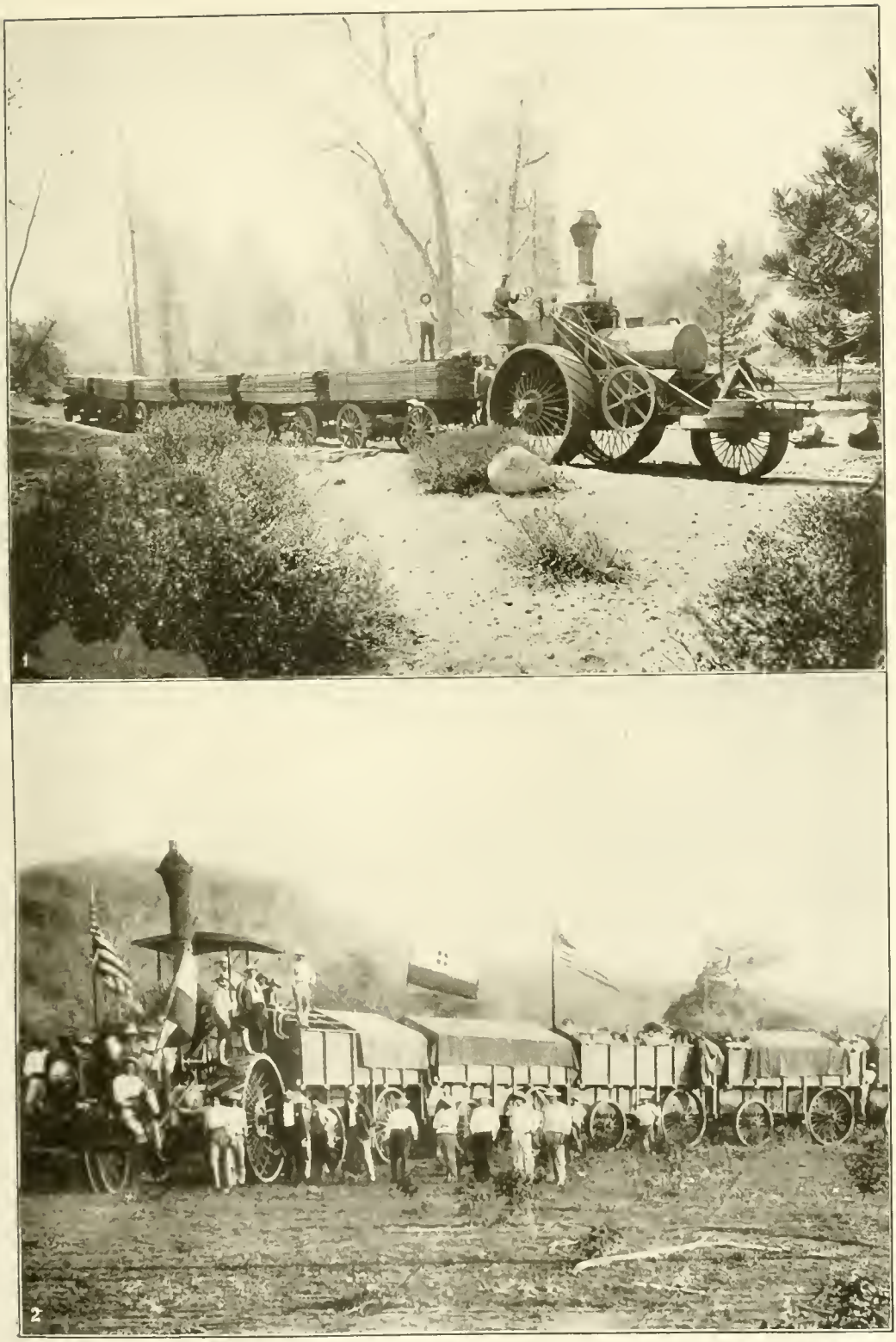
roads, and on a few systems such as the railways in Cincinnati and the suburbs of Washington, a double trolley wire is used, the current passing to the cars through one wire and returning to the station through the other. This, of course, obviates any difficulties from electrolysis, but is so costly and cumbersome that it is only adopted from necessity.

Alternating-current Motors.— Since the successful development of alternating-current induction motors, their adaptability for railway work has been carefully considered and they have been introduced in several traction situations abroad. In this country, no progress has been made in this direction, for two reasons: In the first place, American engineers have not considered them as offering a successful solution to railway problems; in the second place, at the time of their introduction, railway practice was so standardized in this country that it would have been extremely difficult to fit this type of motor into the situations already existing. There are very few situations in this country that do not involve the operation of cars over already existing systems, and the alternating-current induction motor does not permit this to be done. Abroad, quite a number of roads have been equipped, most of them operating for short distances. The most important drawbacks of the induction motor are these: In the first place, the motor has practically the same characteristics as a direct-current shunt motor, and therefore does not afford the variation of speed with load that is one of the most important and valuable features of a series motor. In the second place, three circuits are necessary to operate the machine, and while the track can be used for one of these circuits, the necessity of two wires over each track, the wires having a considerable difference of potential, makes the practical operation of such a traction system difficult. Numerous systems have been devised for regulating these motors, but they are either complicated or inefficient, and it is the opinion of the writer that induction motors will not be used for railroad work except under special conditions. The only advantage such a system offers is the high potential that can be used, and this advantage is neutralized by the fact that the three conductors necessary make high potentials practically unavailable. In the last three years some very important experiments have been made in Germany on high-speed work with induction motors. In this case, the three conductors were strung beside the road, the wires being placed in a vertical plane, beside the track with bow trolleys bearing against them. A voltage of 10,000 volts was employed and attempts were made to attain the highest possible speeds. No difficulty in collecting the current from the conductors was experienced at the highest speeds attained, the only difficulty in the operation of the cars being due to the light character of the road construction. The road was rebuilt and in runs made in October 1903 speeds of over 130 miles an hour were obtained. The data as to the resistance of the trains have not been fully worked out. Since 1902 much attention has been paid to the development of a single-phase alternating-current motor for railway work. A number of types have been experimented on and at present some of the systems are about to be applied to actual commercial operation. These motors are, as a rule, either series motors with special devices to prevent sparking at the commutator, and to obtain the best possible efficiency with a high-power factor, or they have been what is called repulsion motors, in which the armature is short-circuited and the current in the armature is produced by induction from the alternating field. Each of these types of motor has practically the same characteristics as the present. The advantages of such a motor lie in the fact that it can be supplied with high potential alternating current from a single trolley wire, thus doing away with the expensive and uneconomical rotary converter sub-stations; and it offers methods of control that are superior to those used for direct-current machines. The successful development of this motor will make possible the economical application of electricity to trunk lines. See AMERICAN STREET RAILWAYS; STREET RAILWAY CONSTRUCTION.

LOUIS DUNCAN,
Massachusetts Institute of Technology.

Traction Engines. These machines are not to be confounded with the various types of steam and electric automobiles employed at the present time for drawing heavy loads. (See AUTOMOBILES.) They are a special type of steam locomotives and are principally used to haul heavy loads, single or in train, over common highways, or temporary roads such as those in the lumbering regions. They are also extensively used for rolling roads, crushing stone, sawing wood, threshing, etc. Their practical construction was considered by inventors as early as 1759, when Dr. Robinson, a graduate of the University of Glasgow, suggested the possibility of constructing a carriage to be driven by a steam-engine, to James Watts, who was at that time experimenting on the general principles underlying the use of steam as a motive energy; but the first actual experiment appears to have been made by a French army officer, Nicholas Joseph Cugnot, in 1769, when he built a steam-carriage and operated it in the presence of the French minister of war, Duke de Choisnil.

From this time on, a great many experimental forms of traction engines were built, and patents granted for various designs, and the first steam-carriage for common roads capable of carrying passengers was constructed by Julius Griffiths, of Middlesex, England, in 1821. Between 1833 and 1840 the problem was taken up in the United States, and resulted in the building of a successful steam-carriage by J. K. Fisher, in the last-named year; while abroad, from 1840 to 1875, several firms had succeeded in developing a business of considerable extent in the construction of road locomotives for hauling heavy loads, and in building steam road rollers. A general idea of the machines built about this time may be obtained from the following description of a road locomotive built by Messrs. Aveling and Porter, of London: Weight of engine complete, 5 tons, 4 cwt. (11,648 pounds); diameter of steam cylinder, 7¾ inches; stroke of piston, 10 inches; revolution of crank to one of the driving wheels, 17; diameter of driving wheels, 60 inches; breadth of tire, 10 inches; weight of tires, 450 pounds each; length of boiler shell, 30 inches; thickness of shell, 7–16 of an inch; thickness of fire-box



1. A 110 horse power Traction Engine hauling lumber in the Sierra Nevada Mountains.
2. Traction Engine hauling war material for the Nicarauguan government.

sheets outside, ½ inch; load on driving wheels, 4 tons, 10 cwt., or 10,080 pounds. The boiler was mounted upon it, in a manner similar to that of any other portable engine. The driving pinion on the crank-shaft was made so that it could be slipped out of gear, and thus allow the engine to be kept running when the locomotive was at rest. This enabled it to be used to pump water into the boiler, or to drive as a "portable engine," by operating a belt on a pulley, 4½ feet in diameter and 5 inches face, which was fitted to act as a fly-wheel. When in use as a portable engine it was regulated by means of a fly ball governor conveniently attached. The engine valve gear consisted of the standard arrangement of three-ported valve and Stephenson link with reversing lever so generally used on locomotives, while the feed pump, 1¾ inches in diameter and 3⅓ inches stroke of plunger, was driven by an eccentric keyed on the crank-shaft. The connection between the gearing and the driving wheels was effected by one of the most ingenious devices known to engineers — the "differential gear," in which one driving wheel turns freely on the axle while the other driving wheel is keyed fast. A bevel gear is bolted to the hub of the free wheel, and a similar gear is keyed to the driving axle, between which revolves a spur gear which is driven by the engine and which carries two small bevel pinions which engage both bevel gear, so that when it is turned it carries with it both driving wheels at the same time with equal angular velocities, the effort exerted by the engine being equal at both wheels at all times. These engines were capable of being easily and rapidly maneuvered on common roads and in the midst of any kind of obstructions, by an ordinary mechanic or intelligent youth of 15 or 16 years of age, after very little instruction. The drawing power of the engine described was 23,000 pounds, on a grade of 533 feet to the inch, at the rate of 4 miles an hour, or 63,000 pounds on a grade of 225 feet to the mile, at the rate of 2 miles an hour, more than equivalent to the work of 20 horses. The machines of the present time are built practically on the same principles, the difference of construction occurring only in the minor working parts.

W. Morey, Jr.,
Consulting Civil Engineer.

Tracts for the Times, a series of short essays or theological pamphlets published in Oxford between 1833 and 1841 by the leaders of the Oxford movement — Newman, Keble, and Pusey. The publication of these tracts was resolved upon at a meeting at Hadleigh Rectory in 1833, and they were intended to arouse the Church of England to a sense of its true position and heritage, as outlined in the creeds and the Book of Common Prayer. The early tracts, the first of which was written by John Henry Newman, afterward Cardinal Newman, made a great sensation by the freshness and, in some sense, novelty of their character. They were short and peremptory, appealing to the conscience and reason of the people without any rhetorical warmth, but with intense earnestness of tone. Cardinal Newman has described the feelings with which he produced the first tract. He had just returned from the voyage undertaken for the recovery of his health, during which he had written 'Lead, Kindly Light.'

He was in the "exultation of health restored and home regained": he felt, he says, "an exuberant and joyous energy which he never had before or since; his health and strength had come back to him with such a rebound" that some of his friends did not know him. "I had the consciousness that I was employed in that work which I had been dreaming about, and which I felt to be so momentous and inspiring. I had a supreme confidence in our cause; we were upholding that primitive Christianity which was delivered for all time by the early teachers of the Church, and which was registered and attested in the Anglican formularies and by the Anglican divines. That ancient religion had well-nigh faded out of the land through the political changes of the last 150 years, and it must be restored. It would be, in fact, a second Reformation, for it would return, not to the 16th century, but to the 17th. No time was to be lost, for the Whigs had come to do their worst, and the rescue might come too late. Bishoprics were already in course of suppression; Church property was in course of confiscation; sees would be soon receiving unsuitable occupants. We knew enough to begin preaching, and there was no one else to preach. I felt," he goes on with a characteristic recollection of his own experience when he started on his voyage with Froude in the Hermes, "as on a vessel, which first gets under weigh, and then clears out the deck, and stores away luggage and live stock into their proper receptacles."

This first tract was addressed: "To my brethren in the sacred ministry, the presbyters and deacons of the Church of Christ in England, ordained thereunto by the Holy Ghost and the imposition of hands." Its main theme was the doctrine of apostolic succession and the divine origin of the Christian ministry. The tracts followed each other in rapid succession during the autumn and winter of 1833. They sounded over and over again the same note. They asserted what their writers considered to be the true and essential nature of the Christian Church. They traced the relation of the Church of England with the Church of apostolic and primitive ages. They described the authority and apostolic polity of the Church of England. They enumerated the difficulties which beset the realization of the primitive Church ideal in England. They stated the current objections which were made both inside and outside of its pale to the Church's doctrine, its services, and the length of its prayers. They gave their writers' interpretation of the burial service; they treated of prayers for the dead; they deplored the neglect of Church discipline; and spoke sorrowfully of the sins and corruptions of every branch of Christendom. Their most remarkable feature was the profound learning which they exhibited, this being accompanied without formality and without parade. The whole series was anonymous, but the authority of the statements made was amply supported by extracts from the soberest of English theologians, such as bishops Beveridge, Wilson, and Cosin, and translations from early Fathers, Ignatius, Justin, Irenæus. Most of these tracts were written by Cardinal Newman, though John Keble, author of the 'Christian Year,' and one or two others also assisted. They were first of all published with a notice that any one

was at liberty to republish them with any alterations or modifications which he chose to insert. They were distributed gratuitously by zealous friends of the cause. Mozley drove about Northamptonshire leaving packages of these tracts at every parsonage. Cardinal Newman writes in his 'Apologia': "I called upon clergy, in various parts of the country, whether I was acquainted with them or not, and I attended at the houses of friends where several of them were from time to time assembled. . . . I did not care whether my visits were made to High Church or Low Church: I wished to make a strong pull in union with all who were opposed to the principles of Liberalism, whoever they might be."

These tracts naturally produced a profound sensation. They were received in various quarters with surprise, alarm, laughter, or indignant protest. In others they were greeted with eager sympathy, for, as Keble declared, there were "hundreds, nay thousands of Christians, and there soon would be tens of thousands, unaffectedly anxious to be rightly guided in regard to subjects of personal religion, doctrinal belief and ecclesiastical polity."

The first 46 tracts were published in 1834 in one volume.

The following tracts were published with the object of contributing something toward the practical revival of doctrines which, although held by the great divines of the Church, at present have become obsolete with the majority of her members, and are withdrawn from public view even by the more learned and orthodox few who still adhere to them. The apostolic succession, the Holy Catholic Church, were principles of action in the minds of our predecessors of the 17th century; but, in proportion as the maintenance of the Church has been secured by law, her ministers have, under the temptation of leaning on an arm of flesh, instead of her own divinely-provided discipline, a temptation increased by political events and arrangements which need not here be more than alluded to. A lamentable increase of sectarianism has followed: being occasioned (in addition to other more obvious causes), first, by the cold aspect which the new Church doctrines have presented to the religious sensibilities of the mind, next to their meagreness in suggesting motives to restrain it from seeking out a more influential discipline. Doubtless obedience to the law of the land, and the careful maintenance of "decency and order" (the topics in usage among us), are plain duties of the Gospel, and a reasonable ground for keeping in communion with the Established Church; yet, if Providence has graciously provided for our weakness more interesting and constraining motives, it is a sin thanklessly to neglect them; just as it would be a mistake to rest the duties of temperance or justice on the mere law of natural religion, when they are mercifully sanctioned in the Gospel by the more winning authority of our Saviour Christ. Experience has shown the inefficacy of the mere injunctions of Church order, however scripturally enforced, in restraining from schism the awakened and anxious sinner; who goes to a dissenting preacher "because" (as he expresses it) "he gets good from him"; and though he does not get excused in God's sight for yielding to the temptation, surely the ministers of the Church are not blameless if, by keeping back the more gracious and consoling truths provided for the little ones of Christ, they indirectly lead them into it. Had he been taught, as a child, that the sacraments, not preaching, are the sources of divine grace; that the apostolical ministry had a virtue in it which went out over the whole Church, when sought by the prayer of faith; that fellowship with it was a gift and privilege, as well as a duty, we could not have had so many wanderers from our fold, nor so many cold hearts within it.

This instance may suggest many others of the superior influence of an apostolical over a mere secular method of teaching. . . . The Church of Christ was intended to cope with human nature in all its forms, and surely the gifts vouchsafed it are adequate for that gracious purpose. There are zealous sons and servants of her English branch, who see with sorrow that she is defrauded of her full usefulness by particular theories and principles of the present age, which interfere with the execution of one portion of her commission; and while they consider that the revival of this portion of truth is especially adapted to break up existing parties in the Church, and to form instead a bond of union among all who love the Lord Jesus Christ in sincerity, they believe that nothing but these neglected doctrines, faithfully preached, will repress that extension of popery, for which the ever multiplying divisions of the religious world are too clearly preparing the way.

The series came to an end with Tract 90 (see OXFORD MOVEMENT). The doctrines asserted in these tracts may be briefly summarized as follows: The basal principle of their teaching is salvation through the sacraments. The formal principle is the exclusive authority of the visible Church. But what of the Protestant principle of justification by faith? Faith, so teaches Pusey, does not justify, but simply brings us to God, who freely justifies us by grace. In this faith lie other elements, as repentance, hatred of sin, hope of forgiveness. It is the repentant, humble, earnest faith that justifies; and this faith is wrought in us by God. Justification implies two acts on the part of God: the declaring of the soul just, and the making of it what it is declared to be. The first is an *actus Dei forensis*, the second a *justitia infusa*. This double act is essentially but one. God imputes not to us righteousness, but imparts it. In baptism, righteousness is given in germ. It grows by the use of the means of grace. We are justified before works; but works are germinally involved in faith. God rewards each according to his works; hence works stand in relation to the reward of grace. According to this view justification is essentially a *habitus infusus*, and this faith is the grace-life produced by the *justitia infusa*. This is essentially the Roman Catholic view, save that works are not regarded as meritorious, but only as a manifestation of the inner faith. Faith, as appropriating God's grace, has no place in this view; all depends upon a mystical infusion of the divine life. Baptism regenerates; that is, the regularly administered rite is the means through which God works regeneration. In the Eucharist the bread and wine become really,

but in a spiritual manner, the body and blood of Christ; and Christ, as so present, imparts himself to the believer as spiritual food, unto salvation. The consecrated elements are not Christ, but Christ is present in them. The Tractarians adore not the consecrated bread and wine, but Christ as specially present in them. The Church, as the organic body founded by Christ, and perpetuated by apostolic succession, is the sole mediator of grace, inasmuch as she alone can validly administer the sacraments. The Church is one, holy, catholic, and apostolic. But the attributes of unity and sanctity may suffer eclipse in times of schism and misfortune. The Church, as an organism derived by direct succession from Christ, is supreme authority in spiritual matters. Her helps are the Scriptures as interpreted by patristic tradition. But as both Bible and tradition admit of different interpretations, hence it is ultimately to the autonomy of the Church that the believer must look for infallible guidance. The grace and truth that were in Christ passed over to the apostles, and thence to the bishops, and the unity of the bishops finds expression in general councils.

Tracy, trā'sĭ, **Benjamin Franklin,** American lawyer and politician: b. Owego, N. Y., 26 April 1830. He was admitted to the bar in 1851, was district attorney of Tioga County in 1853–9, helped to organize the Republican party in New York State, and served in the legislature during 1861–2. At the opening of the Civil War he recruited two volunteer regiments in New York, the 109th and the 137th, and became colonel of the former. Later he was colonel of the 127th regiment of United States negro troops, and at the close of the war was brevetted brigadier-general of volunteers. As United States district-attorney for the eastern district of New York, 1866–73, he drafted an internal revenue bill which more than trebled the United States revenue at a time when the huge war debt was being liquidated. In 1881–2 he served as judge of the court of appeals, and in 1889 became secretary of the navy in President Harrison's cabinet. His term was marked by a large increase in the navy and the formation of a reserve naval militia. At the close of this service he resumed his law practice in New York. He was president of the commission that drafted the charter for Greater New York in 1895–6, under which he was the Republican candidate for mayor in 1897, but failed of election. In 1899 he was counsel for Venezuela in the boundary arbitration between that country and England.

Tracy, Joseph, American Congregational clergyman: b. Hartford, Vt., 3 Nov. 1794; d. Beverly, Mass., 24 March 1874. He was graduated at Dartmouth in 1814, ordained to the ministry, and was pastor of churches at West Thetford and West Fairlee in 1821–9. He edited the *Chronicle*, Windsor, Vt., for five years, the Boston *Recorder* for one year, and then became president of the Massachusetts Colonization Society and of the American Colonization Society for Massachusetts, which positions he held until his death. He was associate editor of the 'American Theological Review' for many years and published: 'Three Last Things' (1839); 'The Great Awakening, a History of the Revival of Religion in the Time of Edwards and Whitefield' (1842); and 'A Memorial of the Semi-centennial Anniversary of the American Colonization Society' (1867).

Trade. See Commerce; Exports and Imports.

Trade and Manual Training Schools in the United States. The primary aim of the modern trade school is to give the pupil a thorough, practical knowledge of some handicraft. Incidentally, much valuable information may be imparted in connection with the trade — instruction in drawing, mathematics, etc. — but always in direct application to the work of the trade. In the United States, a training in any trade school is intended to supply the place of the old-time apprenticeship, which has nearly disappeared under the present-day conditions of industry. In many cases, the graduates of the trade schools are able to begin work at their trades at wages that are but slightly less than those of the practised journeyman. The courses of instruction in most of the trade schools have been arranged with a view to the training of the pupils to become, within the shortest possible time, wage-earners at some particular trade. The New York Trade School, founded in 1881 by Col. Richard Tylden Auchmuty, was the pioneer institution of this kind in the United States. For several years Colonel Auchmuty had made the subject of trade schools a matter of careful investigation. He found that rapidly changing conditions in the industrial world were steadily destroying the apprenticeship system, hitherto the great source of supply for recruiting the ranks of skilled artisans; and that, as a result, many of the trades had become largely dependent upon foreign countries for their supply of trained workmen. In view of the anomaly revealed by this investigation, Colonel Auchmuty devised and inaugurated a system of instruction carried out in the New York Trade School, which combines practical work (with tools, etc.) with the scientific principles that underlie this practical work. A charge is made for tuition, but the fees are merely nominal. No pecuniary return is sought from the product of the students' work, the policy of the school being opposed to entering the commercial markets and competing for work. The courses offered by the New York Trade School embrace bricklaying, plastering, plumbing, electrical work, pattern making, house painting, steam fitting, fresco painting, blacksmith work, sign painting, steel and other metal work, carpentry, and drawing. Both day and night classes are in operation. In 1892 and 1893 the enrolment was 747 pupils.

The Baron de Hirsch Trade School in New York is one of several similar institutions that have been established in this country and in Europe through the munificence of the late Baron de Hirsch. The instruction is entirely free, and is limited to Jewish young men. Its primary object is to fit young men, in as short a time as possible, to enter one of the mechanical trades for a livelihood. In 1890, the Philadelphia Master Builders' Exchange founded a trade school, and offered courses in plumbing, bricklaying, carpentry, blacksmithing, stonecutting, painting, and plastering. The need of such a school was shown by the fact that within a short time it had received 166 applications for scholarships more than the school could

accommodate. In 1889 the Institute for Colored Youth, in Philadelphia, opened an industrial department, giving instruction in carpentry, bricklaying, shoemaking, printing, dressmaking, etc. At the close of the year 1891 there were 108 males and 151 females enrolled in this industrial department. The Massachusetts Charitable Mechanics' Association Trade School, Boston, was opened 29 Oct. 1900. Its object is twofold: First, to furnish a sufficient number of journeymen mechanics to fill the demand; and, Second, to give American boys an opportunity to learn a trade. Courses are offered in bricklaying, carpentry, and plumbing. A moderate tuition is charged. Another form of trade school is to be seen in the apprenticeship system carried on by a number of large manufacturing institutions. These firms discovered that young men apprenticed to the mechanical trades have in most cases been able to learn only single processes. To overcome this condition, a system of apprenticeship was devised, combining certain educational features adapted to turn out "all-around" mechanics. The Baldwin Locomotive Works have established a system of apprenticeship on this basis. Apprentices are taken in three classes, as follows: The first class includes boys 17 years of age who have had a good common school education, and who are apprenticed to serve four years. During these years of apprenticeship, the boys attend night school, and take courses in elementary algebra, geometry, and the rudiments of mechanical drawing. The second-class indenture is similar to that of the first, except that the apprentices must have an advanced grammar or high school training. During their three years' service they must attend night school for the study of mechanical drawing. The third-class indenture is in the form of an agreement with graduates of colleges and technical schools who desire to secure instruction in practical shop work. In addition to their regular wages, apprentices of the first class receive each an additional sum of $125, and apprentices of the second class an additional sum of $100 at the expiration of their full time of apprenticeship, respectively. Messrs. R. Hoe & Company, New York, have maintained an apprentice school for many years. The sessions of the school are held in the evening, and the apprentice boys are given their supper before they go into the school-room. The teaching force consists of five instructors. The range of subjects covered includes arithmetic, mathematics, mechanics, and mechanical drawing. Commencement exercises are held in June, when the graduates receive their diplomas, and valuable prizes are given to the boys holding first and second rank in the different classes. The Brown & Sharpe Manufacturing Company of Providence, R. I., have had for a number of years an excellent system of apprenticeship combined with a certain educational training, which system is extremely valuable in turning out thoroughly trained journeymen. Unlike many of the manual training schools, none of the trade schools are part of the public school system. The School of Industrial Arts in Philadelphia is the only one, so far as known, that has received any assistance from State appropriations. The special need of our country is for educated mechanics; and now that the apprenticeship system has almost disappeared, the trade school has become an absolute necessity for recruiting the ranks of our skilled labor, so that we shall not be dependent upon foreign countries for our mechanics.

The following is a list of the principal trade schools in the United States:

New York Trade School, New York, N. Y.
School of the Philadelphia Builders' Exchange, Philadelphia, Pa.
Institute for Colored Youth, Philadelphia, Pa.
Williamson Free School of Mechanical Trades, Philadelphia, Pa.
Pratt Institute, Brooklyn, N. Y.
Drexel Institute, Philadelphia, Pa.
Waltham Horological School, Waltham, Mass.
Elgin Horological Institute, Elgin, Ill.
St. Louis Watchmakers' School, St. Louis, Mo.
General Society of Mechanics and Tradesmen of New York, New York, N. Y.
Newark Technical School, Newark, N. J.
School of Messrs. Hoe & Company, New York, N. Y.
Institute for Artist-Artisans, New York, N. Y.
School of Industrial Art & Technical Design for Women, New York, N. Y.
Art Academy, Cincinnati, O.
Ohio Mechanics' Institute, Cincinnati, O.
Technical Drawing School, Providence, R. I.
Rhode Island School of Design, R. I.
Art and Drawing School, St. Louis, Mo.
Lowell School of Practical Design, Boston, Mass.

Manual Training Schools.—The definition of manual training as instruction in tool work as an educational development, brings out the difference between the trade school and the manual training school. The aim of the former is to give the pupil a thorough and practical training in some handicraft; in the latter, on the other hand, education is the primary object. Apart, however, from the educational value of manual training, the pupil acquires considerable practical skill in the handling and use of tools. The Saint Louis Manual Training Schools, Saint Louis, Mo., opened in 1880, were the pioneer manual training schools in the United States. The course includes carpentry, cooking, and sewing. The enrollment during 1901–2 was 1,776 boys and 2,034 girls. Another of the pioneer schools is the Chicago Manual Training School, founded in 1884 by the Commercial Club of Chicago. The Manual Training School of Philadelphia opened in 1885 with a faculty of 13 instructors, and with courses covering a period of three years. Manual training was introduced in the city of New York in 1887. Twelve schools were first equipped with shops and kitchens. The number of the workshops has now grown to 40. The same is true of the kitchens; and active steps are being taken to introduce shop work, cooking, and other mechanical features throughout the entire city. Manual training was introduced in the Albany (N. Y.) high schools in 1888.

Indianapolis, Ind., has a manual training school building which was erected at a cost of $165,000. The school offers courses in bookkeeping, cooking, forging, foundry, free-hand drawing, machine fitting, mechanical drawing, physics, sewing, stenography, woodworking, etc. This school has an enrolment of more than 1,200 students, the majority of whom are boys, with 38 teachers. All drawings and patterns are made by the students themselves, who are thus taught the importance of all parts of the work.

See MANUAL TRAINING; TRADE SCHOOLS.

WILLIAM A. COLLEDGE,
Armour Institute of Technology.

Trade and Technical Press, American. The principal function of the trade and techni

cal publication is the advancement of the commercial, industrial, professional, scientific, or other interest, which may represent, by keeping the reader informed as to the prevailing conditions of his trade throughout the country, and even the entire world. Thus a well-edited, broad-minded, accurate, and progressive trade journal will exert a great influence toward welding together the separate units of each great profession, trade, or industry, into one vast community of interest. The general newspaper and the trade journal differ in the fact that the former appeals to the whole public, whereas the latter caters to a smaller class of professional, commercial, technical, or scientific readers, giving within its compass only such knowledge as pertains to its special field.

These organs, of which every great trade in the country has its own, bring to the attention of those interested any invention or discovery which is, or in time may become, of great importance, but which to the general public would be of little or no interest; they present the conditions of the home and foreign markets by giving tables of quotations otherwise inaccessible to the trade; and gather all possible information which may be a guide to, or throw any light upon, future conditions. Improved processes or methods of manufacture, and changes or improvements in other industries which would possibly have a bearing upon a certain trade; the many items of general interest to the lines with which they are concerned, and the public questions which vitally affect those interests; the almost innumerable changes taking place in the industrial world; all these, and more, are chronicled in every issue of the trade journal, and discussed with a knowledge of detail, a grasp of the subject, and fullness of treatment to be found nowhere else.

Such papers are of much importance to the trades they represent. Some are merely advertising sheets; some contain literary matter along with the special news; others are deeply scientific; yet each is conducted to subserve the interest of the respective trade. Of these papers some are published weekly; some semimonthly; and others monthly; and a number of the financial papers, which may be considered as belonging to this class, are published daily. Some instances among trade journals have enjoyed remarkable and continued success, and have financially prospered far more than had been hoped, but the history of journalism is strewn with the wrecks of others whose existence was of such short duration that they did not pay for the original investment.

That the trade and technical journal may have the highest standard of editorial service and supervision, it is necessary that experts should be employed in the writing of articles, and none but the ablest men in each separate line should contribute, for the reader is generally an expert in the topic of which they treat, and any inaccuracy of statement or error of judgment is not only noticed, but is remembered. This tendency to inaccuracy or error is in a large measure lessened by the employment of a large corps of trained and skillful reporters who ascertain the tendencies of the market before they have become apparent, and also by having, in a great many instances, confidential relations with the leading minds of the trade. Thus a reputation is established, the paper becomes a power in its branch of industry, and is quoted by all as an authority when discussing subjects of which it treats, and of which, in the nature of things, their knowledge is limited.

The trade journal also occupies an important position in the field of advertising, for the judicious advertiser selects the publication which is read by the class to which his merchandise will appeal, and this method is more economical and profitable to him than employing the ordinary newspapers which reach the general public and are not carefully consulted for technical matter. The vast number of advertisements which they publish in every issue, and the enormous prices which they receive per line for such advertisements, are astounding when the competition that exists for all these is considered. That it is profitable, however, to the advertiser, is plainly apparent from the enormous amount of advertising which each journal carries.

Prior to the Revolutionary War the newspapers of America devoted their efforts to obtaining political, war, and foreign news. The news of the markets of the world was but occasionally and briefly reported, the notices rarely extending over 20 lines. In the New York 'Gazette,' of 4 March 1739, there were quotations of rum, molasses, flour, wheat, corn, tea, and sugar, and it was also stated that cotton, wool, turpentine, and indigo were not in the market. Such notices were from time to time inserted in all the other publications of the time, and this practice continued up to the end of the Revolutionary War, and for some years later, although at the end of this period a few of the daily journals printed a larger tabulated market list, sometimes one or two columns in length. Two of the first to do this were the 'United States Gazette,' published by Enos Bronson, in Philadelphia, and the New York 'Diary,' published by Samuel Loudon. Frederick Hudson, in his 'Journalism in America,' states that the first regular and legitimate commercial paper issued in this country was the 'Boston Prices-Current and Marine Intelligencer, Commercial and Mercantile,' the publication of which was begun on 5 Sept. 1795. This publication was soon followed by the founding of two distinct commercial journals in New York, the 'Shipping List' and the 'Price Current.' These latter were consolidated in 1795 in the 'Shipping and Commercial List and New York Price Current.' Though the 'New York Price Current,' begun on 21 Dec. 1795, was preceded by the Boston journal, it is the oldest commercial paper in America, for the latter did not continue the publication of its commercial news later than 1798, but embraced politics and general news, and a year or two afterward changed its name.

Several other journals of this character containing price lists and special news were begun and maintained, and, though meagre and insufficient, supplied the needs of the public up to the end of the first quarter of the 19th century, when, in 1827, the 'Journal of Commerce' was started. This paper was not, how-

ever, a success till it was placed on a thoroughly practical basis by two new men, Hale and Hallock, the former as manager, and the latter as editor. Stock market quotations had been given in the columns of the papers as far back as 1830, but no paper had up to that time made a specialty of reporting them; the first paper making a specialty of this line was the 'New York Herald,' at its beginning in 1833. About 1850 David M. Stone began reporting the money market and though his experience in newspaper work had been small, and the writing of poems and sketches had been his chief occupation previous to this time, his reports were made at such great length and with so much more thoroughness than had ever before been attempted, that they instantly set a standard which has been more or less followed ever since. The Boston 'Post,' the Philadelphia 'North American,' and the Baltimore 'American' then began reporting shipping news, and soon shared with the 'Journal of Commerce' and the 'Herald' their reputation for thoroughness in this line.

These papers did not cover the field as completely as was desired, and the industries of the country had grown to such an extent that it was beyond all possibility for one paper to report the special information of interest to all trades. No weekly or daily can be so planned that it can include special information on all trades among other topics, for the size of the journal would make it inconvenient, and the remainder of its contents would pass unnoticed. The maker or dealer wanted a journal devoted exclusively to his interests.

The 'American Railway Journal,' of New York, first published in 1830, was the first paper which met the desires of one particular class of merchants. This was the pioneer of the specialty commercial journals, and it was for some time the only one of its kind, for though a few others had attempted to enter the field, their stay had been of short duration, and it was not until 1846 that one which still exists, was founded. This was the 'Dry Goods Economist,' but though it began in the largest trade, it experienced much difficulty in attracting attention among either the buyers or sellers, and as conditions at that time were unfavorable to a journal of this character, it was not for a long time and only after a bitter struggle that it rested on firm ground.

These journals were soon afterward followed by those in the hardware and leather trades, known as the 'Shoe and Leather Reporter' and 'The Iron Age,' both of which experienced the same difficulties in gaining a foothold in the commercial world.

Meanwhile, the scientific field had been more successful as to the number of papers and periodicals published. The 'American Journal of Science' was founded in New Haven, Conn., in 1818, by Professor Silliman, and the 'Journal of the Franklin Institute,' in Philadelphia, in 1825. About 1820 a law periodical was founded in New York, but legal journals did not become common until nearly 50 years later. Medical journals soon sprang up in New York, Boston, and Philadelphia, and are now to be found everywhere; a little later a journal was established treating of the drug trade. The 'Scientific American' was founded in 1845 and since then many scientific or semi-scientific journals and various professional journals, not touching upon scientific subjects, have been started. By 1860 there were about 20 trade papers and 50 other technical papers; by 1872 this number had increased to 124 trade and 132 other technical papers, representing 41 different lines, in which religious, agricultural, educational, and sporting journals were not included.

After 1890 the growth of trade and technical journalism was phenomenal; every important trade now has its representative paper and many trades have a large number of publications devoted to their interests exclusively. In 1904 there were more than 1,200 trade papers, the most important trades represented being as follows: advertising, 26; architecture and building, 52; art, 25; baking and confectionery, 15; barbers and hair-dressers, 6; books and book-trade, 23; butchers, 14; carriages, automobiles, etc., 24; clothing and furnishing, 20; coal, gas, water, etc., 17; crockery, glassware, etc., 7; culinary, 7; dental, 18; drugs, oils, paints, etc., 45; drygoods, 29; electrical, 24; fashion, 28; engineering, 34; commerce, finance, etc., 172; furniture, upholstery, cabinet-making, etc., 20; groceries, 34; hotels, 24; ice, 3; insurance, 77; iron, hardware, machinery, etc., 53; jewelry, 12; journalistic, 14; laundry, 3; legal, 78; leather, boots, and shoes, 20; liquor, 36; lumber, 22; milling, 12; mining, 66; musical, etc., 71; photography, 23; postal, 8; pottery, brick, tile, etc., 10; printing, bookbinding, paper, etc., 31; railroad, 36; real estate, 33; sewing machines, 2; shipping and marine, 14; sugar and rice, 11; tobacco, 14; undertakers, cemetery, etc., 7. Beside these there were numerous papers devoted to special interests other than commercial or industrial, such as medical, 215; osteopathy, 10; sports, 100; science and mechanics, 66; agriculture, 307; and large numbers relating to the colored race, Sunday schools, education, religion, prohibition and temperance, colleges, religious societies, etc. See ADVERTISING; AMERICAN PUBLISHING; AMERICAN NEWSPAPERS; AMERICAN PRINTING TRADE; NEWSPAPERS; PERIODICALS; JOURNALISM; PRINTING; PRINTING PRESSES; BOOKS; ETC.

Trade Associations, or **Trade Protective Societies,** are associations of merchants, tradesmen, and others, formed for the promotion of trade and for protecting the individual members from losses in their business transactions. See also MERCANTILE AGENCY.

Trade, Board of. (1) In the United States, a body of men selected from among the business men of a city, and appointed to represent and act for the whole business community in advancing and protecting their interests. (2) In England, a permanent committee of the Privy Council, presided over by a member of the Cabinet, and divided into seven departments, each having its separate staff.

Trade Dollar, a former coin of the United States, containing 378 troy grains of silver and 42 troy grains of alloy. Trade dollars, issued under Act of Congress 12 Feb. 1873, were legal tender to the amount of $5. Those issued under the Act 22 July 1876, possessed no legal tender power. They were intended for trade with countries doing business on a silver basis.

Trade-marks. Certain marks or inscriptions set on manufactured goods for the purpose of identifying their origin. An examination of the evolution and development of the trade-mark in the United States of America is substantially an examination of the evolution and development of the vast commerce of our country.

Trade-mark law in the United States has substantially been made during the past three decades; for the first reported American trade-mark case found in the books is that of Bell against Locke, decided by Chancellor Walworth in the court of chancery in the State of New York in January 1840. The following reported American trade-mark cases are desultory and sporadic until about the year 1870, when they became more numerous. Since that time, trade-mark litigation has vastly increased.

Definition.— A trade-mark is a mark or sign indicating the source or origin of the article to which it is affixed. It may consist of a word or words, or of a symbol, design, device, or picture; or it may be constituted by an original and distinctive shape or form of package in which the goods are packed or contained; or it may consist of a combination of some or all of these elements; but in whatever form the trade-mark appears on the market, its office is either to indicate the origin or source of manufacture of the article, or when used, as it may be, by the dealer who sells to the ultimate purchaser or consumer, but who does not manufacture or produce the article, it may then indicate selection or a supervision of the manufacture of the article bearing such dealer's mark.

Office of the Trade-mark.— Not only does the trade-mark indicate the source or origin of the goods to which it is attached, but it also performs the office of guaranteeing or assuring to the purchaser, whether he be an intermediate or an ultimate one, that the honest skill of the owner of the trade-mark, the good quality of the goods, the carefulness of selection, the purity of ingredients or correctness of weight or measure, are to be found in the articles to which such mark is affixed.

Of the Origin of the Trade-mark.— The introduction of the trade-mark into commercial use was natural, and when once effected rapidly became a trade necessity.

A chemist in the olden days prepared a mixture or lotion and recommended it to the customers of his shop, who found it efficacious. A shoemaker made shoes for his patrons, which by reason of good quality and superior workmanship, won favor for him among his patrons; so that these trades-people, pursuing their various lines of industry, not only retained their custom, but were recommended by their patrons to others, such customers becoming accustomed to resort to the shop of the one or the other of the tradesmen who supplied such wants, a habit which is known in law as the good will of a business.

So long as the customer of the chemist transacted his business face to face with him in the same old shop, or so long as the shoemaker measured his patrons and delivered his goods to them in person, so long was it unnecessary for such manufacturers to mark their wares.

Their customers and patrons obtained a personal delivery and needed no other assurance or guaranty as to the genuineness of the articles purchased by them; but after a while, some of these purchasers and users of these various articles removed to other localities, and would desire to continue to use the same lotion or wear the same shoes; and they would order the same directly, if they could, or through some agent or middle-man if they could not; and then in the latter case, to quiet any apprehensions which such customers residing at a distance might feel regarding the genuineness of the articles delivered to them, the chemist would affix a label to the bottle or jar containing the lotion, which would bear his name and address; and the shoemaker would mark on some part of the shoe his name and address; after a while the producers of these various articles found that the mere use of their name and address, while constituting a good and sufficient indication of the origin of their products, was nevertheless subject to several matters of inconvenience; the first was that perchance many of the customers could not read; and the next was, that the use of the name of the manufacturer alone was attended by a legal difficulty, to wit, that while a man's name would constitute a most perfect trade-mark, yet any other man bearing the same name had an equal right to use it, provided he did so honestly and fairly, and if engaged in the same line of business, a trade confusion would naturally, and often did arise, as witness the Brown Iron Bitters case.

Adoption of Symbols and Arbitrary Words.— To reach and remedy these difficulties, manufacturers then began to adopt and use symbols consisting of pictures or devices, at first simple in their nature, such as shields, stars, geometrical figures, or representations of animals and the like; they also coined arbitrary and fanciful names, not descriptive of kind or origin, which were generally used in connection with the name and address of the manufacturer; and so it came to pass that symbols, devices, and arbitrary designations or titles were slowly, gradually, but generally substituted in the place of the mere name and address of the manufacturer; the goods in due course of time became known by such marking; the marks, in turn, served to indicate origin, as well as to guarantee whatever the purchasers or consumers expected and had a right to find in their purchases with respect to quality, purity, measure, or value.

So public usage has also often given an accidental meaning to a trade-mark, not at all contemplated originally; as witness the case in France, where a man named Jean Bardon manufactured cigarette paper, marking it with his initials, "J. B.," which he separated by a lozenge, so that the mark appeared to be the word "JOB." The public became accustomed to call for "JOB" paper, and that name was duly protected as a trade-mark, although it had never been intended to invent or use the word "JOB" in connection with the Jean Bardon cigarette paper.

Requirements of a Valid Trade-mark.— Inasmuch as the markets of commerce are

«markets overt» or «open markets,» it soon became evident that, in order to secure a trade-mark which would be unique, and the exclusive property of the person or firm originating and adopting it, such mark would of necessity have to be one which others did not have an equal right in law to use for the same class of merchandise; so that it became an established rule of construction of the law of trade-marks that no mark would be protected as the exclusive property of any one person which others had an equal right to use; as, for instance, a mark indicating quality, or a geographical mark, indicating that the goods bearing the mark were made or produced in a certain locality; or a mark which merely consisted of the statement of ingredients, or the generic or class title of the article; to be perfectly plain, every person living in New York, making hats or shoes, or other articles of commerce, would have the right to label and mark such articles as «New York Hats» or «New York Shoes» or the like; so every person would have the right to make the «Best Quality Hats» or the «Best Quality Shoes» or «Superior Hats» or «Superior Shoes» or the like.

Kinds of Trade-marks.— There are two distinct kinds of trade-marks, to wit, a mark consisting of a word or words, or a mark consisting of a symbol or picture.

The former kind may be designated as an «ear-mark,» and being mainly distinguished, when used, by its sound, it has been held by high authority that the use by another of a similar word, alone or in any form or combination, or in connection with any style of label or form of package, is unlawful, and would constitute an infringement upon the original mark.

The other kind of a mark, consisting of a symbol or picture, may be designated as an «eye-mark,» because it appeals to the sense of sight. To constitute an infringement upon such a mark, the defendant's mark must be of so close a resemblance as to be likely to mislead a purchaser using ordinary caution. There may also be an infringement upon important parts of a trade-mark, without the whole of the mark being copied, which will be restrained, because the law does not look for complete identity in the imitating trade-mark, but similarity will be held sufficient to warrant the interposition of a court of equity.

«Secondary Meaning» Phrases Protected.— In dismissing this branch of the subject, it may be stated that no mark which merely indicates an essential element or quality of the article to which it is applied can be exclusively appropriated as a trade-mark, subject, however, to one important qualification which has attended the evolution of the law of protecting industrial property in this country, and which was rendered necessary by the natural and proper desire on the part of our courts and judges to do equity and to protect the purchasing public.

The exception to which we refer is, when a term, phrase, title, or designation which is used in connection with a trade-mark, acquires what is known as a «secondary meaning» in the market.

By this we mean that when a phrase, title, or designation, which of itself could not be protected as a technical trade-mark, because primarily conceived and designed to merely invite trade or catch and engage public attention, becomes in time so identified and associated with the article of merchandise to which it is affixed, that the public, on seeing it, at once recognizes that it stands for the goods to which the trade-mark proper is usually attached, even though that mark should be absent.

An illustration of this may be found in the case of a certain trade-mark for medicine; the words «Candy Cathartic» are certainly descriptive, as fully descriptive as any words well can be; but they had been used to so large an extent and were so thoroughly advertised in connection with the medicine in question that it was shown that many purchasers instead of calling for the trade-marked name of the article, would ask for «Candy Cathartic,» and *vice versa;* druggists handling the article so associated and identified the secondary phrase or title, «Candy Cathartic,» with the trade-mark proper, that when «Candy Cathartic» was called for, a box of the pellets would be promptly handed out. The court accordingly protected such descriptive phrase against use by a competing firm.

«Camel's Hair,» a purely descriptive term for belting, was protected after it had acquired a secondary meaning on the market. Likewise, «Stone» was upheld as a designation for ale, the name Stone being the name of the village in which the brewery was located.

Likewise, a geographical name may acquire a secondary meaning, especially against infringers who do not reside in the same geographical territory or locality; as witness the fact that «Saint Louis» was protected as a mark for lager beer against brewers using the same title, but not doing business in the city of Saint Louis. The history of the «Durham» tobacco case may also be profitably considered, where Blackwell, the proprietor of «Durham» smoking tobacco, failed in his attempt to restrain another tobacco manufacturer of Durham from using such title in connection with tobacco, whereat certain Virginia tobacco manufacturers, becoming emboldened by the defeat of the Blackwell concern, began to use the title «Durham» in connection with their tobacco, but were promptly enjoined from so doing by the courts.

The Doctrine of Clean Hands.— Another and most important matter to be considered by the owner of trade-marks is in their correct use of their trade-mark.

The usual protection and relief sought against infringement and the invasion of trade-mark property is by means of a suit in equity brought to restrain the infringer from continuing to imitate or use the infringing mark, and for an accounting for damages; but as such a proceeding in equity is governed by well-settled principles of equity, one defense which has been very often successfully urged and raised to defeat any action on the part of the owner of a trade-

mark is what is known as the defense of "unclean hands."

It is a well settled principle of equity that "he who enters a court of equity, seeking equity, must do equity, and come with clean hands."

In other words, a party will not be heard to complain of the wrongful acts of another as against himself, if that same party has been guilty of similar wrongful acts of fraud, misrepresentation, or deceit against the purchasing public.

The United States Supreme Court in the celebrated and leading case of Manhattan Medicine Company against Wood, many years ago, laid down the doctrine that a party would find no relief in a court of equity as against an alleged wrong-doer if he himself were guilty of wrong-doing in using the mark to deceive the purchasing public.

Having this important fact in mind, it behooves trade-mark owners and users to be very careful in the use of their marks, labels, and packages, and the following simple rules may well be observed for their protection and benefit.

No misstatements concerning the origin, quality, or quantity of the articles to which the mark is attached should be used in connection with the labels, packages, or accessories of the goods. So, also, if a trade-mark was not originally adopted by a party but was acquired by transfer or assignment, such fact must be distinctly announced on the labels or packages.

While the doctrine of "Unclean Hands" has been carried to a very great extent by the courts, it has been held in many cases, that too strict an application of such a rule would lead to the destruction of valuable industrial property, and, at the same time, relegate the purchasing public to the tender mercies of false, fraudulent and infringing marks.

The courts have in many cases recognized the fact that where there is no vicious or wrongful intent on the part of a trade-mark owner, who is shown to conduct a legitimate and honest business, that slight lapses or immaterial misstatements, not persisted in or continued, and statements which are substantially true, although not entirely so, will be overlooked and not visited with the punishment of denying equitable relief to the trade-mark owner who is guilty of such infractions.

The understanding which the public has of certain trade customs or usages are also allowed to prevail; as witness the "Hennessy Brandy" cases, decided by the New York courts of appeals, where the defense was interposed that the plaintiff's bottles were not full or actual pints or quarts in size, and that, therefore, the owners of said trade-mark were guilty of inequity and misconduct; but the court held that inasmuch as such pints or quarts were known as "commercial" pints or quarts, and understood so to be by the purchasing public, that no fraud was either contemplated or had been committed, even though the bottles to which the mark was attached were not of full measure.

How Trade-mark Property is Acquired.—Property in a trade-mark is acquired by original adoption and use on the market. A mere announcement of an intention to adopt a certain title or symbol, which is not followed or accompanied by use on the market does not confer any trade-mark rights; and so the title to a mark may be lost by deliberate abandonment or the transfer to others of the title or good will of a business in which the mark has been used.

The person who originates, adopts, and first uses a certain distinguishing mark for his goods, becomes possessed with what is known as the common law right of ownership thereof, and such right is an enforceable one, and will be protected by the courts of this country.

Patent Office Registration.—Trade-marks may be registered under the existing registration statutes only when the same are used in commerce with foreign nations, or among the several States, or with Indian tribes. The provision for marks used among the several States is new and in force since 1 April 1905. Under this law marks exclusively used for ten years preceding the passage of the law can be registered, irrespective of the prohibitions in the law, which would otherwise apply. Registration confers no greater property rights than are acquired under the common law right of ownership, except that triple damages may be recovered in certain cases.

Assignment of Trade-marks.—Trade-marks may be assigned with the good will of the business in which they are used, or a transfer of the business itself; or they may descend by inheritance; but such an assignment must be recorded in the United States Patent Office within three months of its date or the good will thereof does not vest in the assignee any enforceable right or title.

Partnership Marks.—Upon the dissolution of a partnership, either partner may thereafter continue to use the trade-marks of the partnership, unless the same are otherwise disposed of upon the dissolution, or where other contractual relations exist governing the future disposition of the same upon a dissolution.

Defenses.—In cases of infringement, actual deception by the infringer need not be proven. The likelihood of deception is sufficient to warrant the interposition of a court of equity. So it is no defense that the infringing article is superior in quality to the genuine, nor is the absence of intent to deceive, a defense. Laches or delay in asserting rights are generally held to deprive the owner of the right to claim damages or obtain a preliminary injunction. Abandonment is also a good defense, but strict proof of an intention to abandon ownership is essential to the establishment of this latter defense.

Patented Articles.—Where a new trade-mark consisting of a word-symbol is affixed to a patented article, the right to use such name or title for such article will become public property upon the expiration of the letters patent, as was held in the "Castoria" and "Singer Sewing Machine" cases. Otherwise the monopoly enjoyed by the owner of a trade-mark is perpetual.

State Laws.—In many of the States, acts have been passed making it a criminal offense to refill or use again without the owner's consent, bottles or other packages which have been registered under what are known as

«Bottling Acts» or Trade-mark Registry Acts; so in many of the States the imitating or counterfeiting of trade-marks is made a criminal offense.

Labor Union Marks.— In many of the States, labor unions or associations of working men are permitted to register their labels or trade-marks, indicating that the goods to which such labels or marks are affixed were manufactured by union labor, and such acts have been sustained as constitutional in most of the States.

Copyrighting of Labels.— New labels, not previously used, and containing some artistic or novel character of design, may be copyrighted in the United States Patent Office and will be protected for 30 years. But labels which merely describe an article, or only indicate size, number, or weight, or are only the result of the application of the typesetter's art, are refused copyright entry.

Unfair Trade Competition.— An article on the subject of trade-marks and their protection in this country would at the present time be utterly incomplete without some mention of the cognate subject of «Unfair Trade Competition.»

The evolution of the law of trade-marks in course of time satisfied the courts and judges of this country that the mere enforcement of strictly technical trade-mark rights fell far short of the practical requirements and necessities of our commerce, inasmuch as the purchasing public was being constantly cheated and defrauded in having goods not of a genuine source of origin foisted upon them, while the owners of such genuine goods, as well as the purchasing public, were frequently left without redress or legal protection. To remedy this defect of the administration of justice, the restraining of unfair trade competition was applied to cases where technical trade-mark rights could not be enforced.

The essential difference between a case brought to restrain the infringement of a technical trade-mark, and to restrain a case of unfair trade competition, may be summarized as follows:

Both suits are brought to restrain a fraudulent act of the defendant; both proceed on the theory that a court of equity will protect the property rights of the owner of the trade-mark, and at the same time, guard the purchasing public against being deceived; but while in a case brought to restrain the infringement of a trade-mark, no proof of actual deception is now required, nor is any proof of damage to the owner of the imitated trade-mark required to enable him to recover, in a case of unfair trade competition the essence of maintaining the suit is in the establishing of the fraud practised by the defendant and the actual deception caused thereby upon the purchasing public.

It thus follows that in the extension of the principles of doing equity and according the fullest protection to the purchasing public, a man may even be restrained from using his own name in the transaction of his business, where such use is of a fraudulent character, calculated to breed trade confusion and designed to mislead and deceive the purchasing public.

The Philosophy of the Law of Trade-marks.—The whole legal and underlying principle of the law embraced in this subject and its entire philosophy are founded upon the theory of securing honest trade and fair trade in the commerce of our national markets, and the doing of strict justice between man and man, while protecting the extremely valuable property rights which are at the present time found to exist in the transaction of modern business, both in the ability to enjoy unmolested and secure from invasion the marks of commerce, as well as to retain the good will of the business in which they are used.

Equity has been poetically termed the «flower of justice»; and equity, with its long arm, and with the acute conscience of the court, is able to prevent and remedy acts of injustice, where the law itself would otherwise prove powerless and futile.

Bibliography.— The leading works on the subjects considered in the foregoing article are: Browne, 'Trade-marks'; Upton, 'Trade-marks'; Cox, 'Manual of Trade-mark Cases'; Coddington, 'Digest of the Law of Trade-marks'; Koehler, 'Trade-marks'; Price & Steuart, 'American Trade-mark Cases'; Paul, 'Trade-marks'; Hopkins, 'Unfair Trade'; Newton, 'Patent Office and Trade-mark Cases'; Greeley, 'Foreign Patent and Trade-mark Laws'; Sebastian, 'The Law of Trade-marks'; Kerly, 'The Law of Trade-marks.'

MORRIS S. WISE,
Editor of the 'Trade-Mark Record,' New York.

Trade Schools. The difference between trade, technical, industrial, and manual training schools is so little understood and the terms are used so interchangeably that some effort at definition is necessary before considering the subject.

A *trade school* is designed to train apprentices for a particular trade. The decadence of the old apprentice system has taken away the possibility of an adequate training for the young wage-earner in the ordinary workshop. The trade school has therefore been organized to take the place of this older form of training. It aims to give such an ideal preparation as shall abolish the drudgery and waste of the shop by supplying an economic instruction in the practical work of various trades, and in the necessary theory. A trade school proper is therefore an enlightened apprenticeship. Such schools may be founded to teach a single trade, such as watchmaking or tailoring, or they may have a more extended programme and teach several occupations. The simplest form of a trade school is a workshop where only the manipulation of some trade is taught, the expert use of tools being all important. A more advanced class of trade school adds to the first form the theoretical instruction which underlies the trade. A still more elaborate system is found in a few schools where four-year courses are offered. Not only are there trade schools proper, offering day courses in their own workshops, but there are trade schools in which the experience which the worker is gaining in a regular workroom during the day is supplemented by theoretical courses at night. Such schools are often under municipal or private control. In Germany, where they have been most extensively devel-

oped, they are called "continuation schools." They also correspond to certain of the so-called technical schools of England. This type is occasionally seen in connection with some industrial enterprise, which thus provides its own workmen with an opportunity for improving themselves.

The aim of the *technical school* is not to take the place of an apprenticeship, but rather to help those who already know something of a certain class of work and wish more scientific or theoretical knowledge of it. The technical schools therefore prepare the overseer or superintendent rather than the apprentice. In their simplest form only such use of tools or apparatus is taught as will show the connection of theory with practice. Handwork is given to explain the science rather than to fit a student directly for a trade. The highest development of this type of school is found in the great technical institutions where both the application of art to industry and the most thorough scientific training are provided. The Massachusetts Institute of Technology and the great German and American textile schools are examples of this class of instruction.

The night technical schools, so numerous in all parts of America and Europe, often partake of the nature of the supplementary trade schools in that they also aim to add to previous knowledge, but the trade schools more directly connect with the trade followed by the students during the day. The handwork courses in connection with public instruction, and many of the Young Men's Christian Association courses, are examples of this kind of technical instruction. In England this class of institution is the favorite, polytechnic schools, for example, offering supplementary instruction of this type. The labor unions there are more rigid in their regulations than in America, and the schools have had to concede to their views. The English schools were forbidden to teach trades by the act which created them and gave them support. The new education bill, however, endeavors to make trade schools a part of the educational system.

Industrial schools, as the term is understood in America, aim to teach one or more branches of industry, with the idea that habits of order and work will be inculcated in the pupils. This form of school is used to a great extent for reclaiming young offenders from evil habits, or in schools for neglected children. The work is primary in character.

The manual training school has still a different object. Handwork is given with the sole idea of utilizing its power in developing or educating the individual, that the hand and mind may be trained together and each help the other. The general education in these schools has no relation to the trades, and is carried farther than is necessary or possible for the ordinary apprentice.

This article deals solely with the trade school as it trains apprentices or journeymen, or supplements their work in the regular trade by night courses of theoretical instruction. It does not consider the higher so-called trade schools, such as the textile and engineering schools, which train overseers, superintendents, and directors rather than the mere wage-earners. The instruction in the latter is of the college or secondary grade rather than the preparatory, and they belong in general more to the technical than to the trade school field, although many of them have special sections for apprentices. The problem of trade instruction is often met, therefore, in institutions whose aims are different. Many of the agricultural and mechanical colleges in the United States have trade departments, this work not leading to a degree. The Agricultural and Mechanical College for colored people at Greensboro, N. C., and many other similar institutions in the United States are illustrations of this type. Many of the manual training schools are also engaged in teaching trades as well. Drexel and Pratt institutes also deal with some features of trade work in addition to their regular technical or normal aim. Regular trade schools are new in the United States and are not yet numerous, and this overlapping with other classes of institutions has been necessary to meet the demand of different communities for an increase in this kind of instruction.

Education for trade has for centuries received attention on the continent of Europe. Complete systems of industrial education have been developed in many countries, from the kindergarten and manual training of the grades through the trade and technical schools to higher engineering and scientific institutions. These schools are generally under government support and control. Within the last 50 years they have become increasingly important and are graduating competent workers for both men's and women's employments. The thoroughness of the courses in these continental schools has rightly given them a high reputation. The length of the trade courses abroad is from three to five years, a fact due to some extent to the demand of the trade unions for a long period of apprenticeship. The United States has few trade schools offering a like preparation. Conditions of artisan life with us are so different that the foreign type of trade school does not meet our needs. The aim here has been rather to give the trade work in as short a time as possible, often only a few months. This course is frequently accompanied by considerable drill in the theory as well as in the practice of the trade. The New York Trade School offers in its day classes three to four months' preparation in various building trades, certificate of proficiency being issued on the completion of the work. European schools do not give such short courses as these. The Wilmerding School of Industrial Arts and the School of Mechanical Arts, both in California, and the Williamson School of Mechanical Trades in Philadelphia, correspond more nearly to the European model of thorough training for three or four years. In these schools the aim is to teach the trades with the science underlying them, together with a thorough academic course corresponding to that of our Manual Training High School. The Manual Training High School of the United States surpasses anything of the kind abroad and is a distinctly American type. It does not aim to give trade instruction, and hence the Williamson and the two California schools are not strictly manual training schools.

The value of trade schools has been recognized by foreign governments and they not only

control, but also support or subsidize them. The few trade schools already organized with us are under private management. The movement in America is too new for the results of the various methods to be evident, and we have therefore not decided what is the best manner of conducting such schools.

Germany has developed a valuable phase of trade instruction to supplement the private shop apprenticeship. The poverty of the workers there, as well as here, forces them early into the shops to earn a living. In order to help these workers to obtain better positions and better salaries, special evening or Sunday instruction has been arranged in the continuation schools. Each German state has made a study of the best way to help its different trade workers. These schools have been so satisfactory that they have not only developed all over the empire, but also in Austria and in other countries. In Germany they are preferred to the all-day trade school. Belgium and France are renowned for their day trade schools; Austria and Hungary have unusually complete systems of trade instruction, and Switzerland and Italy also provide carefully for this class of education. For 35 years Russia has had trade schools to train the workmen in various fields. England's well-organized technical instruction is showing a tendency to include trade work also.

The ideas of the various countries that have given special attention to trade schools, together with illustrations of leading institutions, will show the present status of this feature of education.

Germany.— The awakening of Germany to the importance of training her wage-earners took place about three decades ago. The Centennial Exhibition in Philadelphia in 1876 showed Germany's products to be distinctly inferior to those of other continental countries. The French exposition of 1878 still further manifested the lack of art in Germany's manufactured goods, and a commission was appointed to investigate reasons and to suggest action. The result of the work of this commission is now seen in the systems of trade and technical schools which have been organized, and in the reputation which Germany now has for the application of science to industry. These schools have been great factors in this change. The German section in the Saint Louis Exposition of 1904 gave evidence that not only in the connection of science with, but also in the application of art to industry, that country has pushed to the front and now takes rank with or even excels those nations which have in the past controlled the industrial field. Germany has become thoroughly imbued with the idea that money devoted to trade instruction is wisely spent. The earnest study which she has given to the subject has shown her the problem in its complexity and difficulty. The solution has been varied to suit the needs of various localities and also of all classes of workers, from the wage-earners of small skill to the directors of great industries.

These schools have been founded and are supported in various ways, by the State, by the municipality, by the commune, by the trade guilds, by associations of workers, or even by private individuals. There is a marked tendency, however, for the governments of the German states to assume the entire control and administration. Small tuition fees are frequently charged. In some of the great technical or technological institutes gratuitous instruction is offered to apprentices, but a fee is required of those who wish to study for more advanced positions. The tuition fees, however, cover but a small part of the expenses.

Germany is giving attention to the training of apprentices for trade in the following classes of institutions: Trade Continuation (Fortbildungschulen) and Industrial Continuation Schools (Gewerbliche Fortbildungschulen); Trade Schools (Fachschulen); Industrial Drawing Courses; large technical schools, with sections for apprentices; apprentice workshops (Lehrwerkstätten).

Of these the *Continuation Schools,* generally conducted by trade guilds, are by far the most popular for training the ordinary wage-earner. Education is compulsory in Germany up to the fourteenth year. After this time a majority of the children of the laboring class must begin to work to contribute to the support of their families. The continuation schools are formed to aid those of both sexes who are forced to work, their object being to supplement the trade in which the worker is daily employed. In industrial centres the curriculum is connected with the trades of the locality. In other sections, the character of the instruction may be general, commercial, or even agricultural, as the need is felt. The course deals more with the theoretical part of the work than with the actual manipulation of tools. The aim is to give such instruction as the worker cannot well get in the shops. It correlates with the daily shop work and thus aids the workers with the greatest economy, as the students are productively employed and expensive laboratories and shops are not necessary.

The beneficial effect of these continuation schools on the development of industry and on the condition of the working class has been felt so keenly that the imperial government has provided by law that employers must always permit their employees under 18 years of age to attend such schools if they desire to do so. Many of the state or local authorities have made this education compulsory, it being felt that all employees should have an education which will enable them to better understand the nature of their trade. It often happens that these busy day workers are too tired when night comes to benefit by such instruction, and Sunday classes have therefore been arranged at hours which will not prevent attendance at divine service, and certain morning or afternoon hours on week days are also utilized.

The industrial continuation schools give instruction of a general character, but they emphasize drawing, bookkeeping, and such branches as are likely to be of value to those engaged in shop or factory work. For girls they add embroidery, cutting, sewing, ironing, millinery, mending, and cooking. In the larger German cities the work of the industrial continuation schools is so specialized for individual trades or groups of trades that they are really trade continuation schools.

The trade continuation and trade schools proper usually differ from the industrial continuation school in giving more specialized trade

instruction. An illustration of trade continuation work for boys is the Artisan School, No. 1, in Berlin. The aim is to "give to apprentices and workmen, especially during their leisure hours, a knowledge of drawing and the applied sciences and arts which concern their respective trades and which serve as the necessary complement to their shop practice." All of the drawing, mathematics, and sciences are specialized in separate courses directly adapted to some trade. The hours of instruction are in the afternoon and evening of week days, and on Sunday morning. All-day courses in trades are also given at this school.

Trade Schools with all-day work in a single trade are numerous, but are not largely attended. Schools of watchmaking, basketmaking, cabinetmaking, horseshoeing, toymaking, and other trades have been opened in response to local needs. The following is a partial list of the occupations provided for in the trade schools: Artistic darners, artificial flowermakers, bakers, barbers, basketmakers, blacksmiths, braziers, bookbinders, cabinetmakers, chimney sweeps, cooks, carpenters, confectioners, dressmakers, dyers, embroiderers (hand and machine), engravers, gardeners, garment makers, glaziers, goldsmiths, horseshoers, hairdressers, handsewers, ironworkers, joiners, knitters, lacemakers, leatherworkers, locksmiths, laundresses, masons, modelers, machinesewers, menders, milliners, paperhangers, painters, photographers, potters, printers, rugmakers, saddlers, spinners, stonecutters, stuccoworkers, strawplaiters, shoemakers, tinsmiths, tailors, trunkmakers, woodworkers and carvers, weavers, wickerworkers, watch- and clockmakers, wagonmakers, wheelwrights.

Trade work for girls in Germany is not as extensively developed as that for boys. For many years, however, schools have been organized by associations of women, especially in Prussia. The sentiment of the German people, that woman's place is in the home, has caused these institutions to combine strong housekeeping features with the trades. These housekeeping-trade schools are doing excellent work, but the trade continuation schools organized for women are of more general importance in training for definite trades. Most of these schools offer three distinct fields to women: (1) The commercial subjects, which prepare for clerkships or secretarial work, training stenographers, typewriters, etc.; (2) the domestic industries such as housekeeping, cookery, needlework, repairing, and ironing, and (3) special trades for women, such as dressmaking, millinery, white work, art needlework, designing, bookbinding, compositing, and photography. In Berlin the nine municipal continuation schools for girls maintained by the city, and the Victoria Continuation School maintained by private funds, are typical schools of this character. They offer day as well as night work.

The Lette Society of Berlin has done much to foster trade instruction for girls. The aim of the society is the improving of the working class by (1) the removal of obstacles and prejudices in the way of female employment; (2) the fostering of commercial and industrial education; (3) the furnishing information for opportunities for learning trades and securing situations and help where existing institutions are inadequate; (4) the establishment of exchanges from the exhibition and sale of women's handwork; (5) the protection of women against harm, morally or otherwise, especially regarding lodging houses. This society has opened a number of different kinds of schools. The trade courses range from four to six months of all-day work.

The Schools and Courses of Industrial Drawing and Art have made their curricula so practical that they adapt themselves directly to the various trades. They may be considered in this article, since they offer special work for each trade. There are also, in many instances, workshops in connection with these art schools, in order that the student may have practical experience of the value of his designs and plans. The building and textile trades and such art industries as the making of jewelry, metal and wood working, engraving, gold and silversmithing, painting on glass and china, ornamental designing, and decorative painting, are especially considered in these schools.

Elaborately developed systems of special *Technical Schools* provide for all grades of positions in the building and textile trades. They touch to a small degree the problem of training an apprentice. These great day schools have been very successful. Over 50 of them are to be found for the building trades, and Prussia alone has eight for the textile trades. There are three grades of labor in the building trades: (1) architects; (2) those who execute the architect's plans, and (3) the workmen. The evening continuation school sometimes provides for the lowest grade, and at other times the building trades school offers a special section. The textile trades have also three grades, and weaving workshops are provided for the apprentices, either in all-day work or in evening and Sunday classes. In some of the textile schools women are admitted, the one at Aix-la-Chapelle offering an elaborate course of textile darning, the girls being paid wages according to the value of their work. The School of Textile Art in Plauen, Saxony, has also a department for women. Instruction in embroidery and the making of lingerie is given, the aim being to train superintendents of workrooms.

Apprentice Workshops are organized both in connection with public trade schools and as private institutions. They aim at a more comprehensive and systematic training than can be obtained in the ordinary shop.

Itinerant Trade Courses are also provided in such industries as weaving, garment cutting, embroidery, machine work, straw plaiting, and bookkeeping. These courses have been beneficial in small towns where there are cottage industries.

The effort of organized labor to preserve handwork and the small trades has been of vast service in Germany in the development of trade schools. The various trade guilds have dealt carefully with the subject of apprenticeship and have been untiring in their efforts to have favorable conditions attend such instruction.

Belgium.— Education is not compulsory in Belgium, but the schools are well attended. The primary school is followed by an excellent system of trade education for both sexes. In many particulars the schools are similar to those in the neighboring countries, but they also present

characteristic features. For boys the elementary trade schools are followed by superior trade and technical schools, and those again by the great technological institutions.

Trade instruction is carried on in the industrial schools (écoles industrielles) and in the trade schools (écoles professionnelles). The first gives theoretical instruction in industrial operations with practical courses in design. This class of school holds night and Sunday sessions. The second gives trade work combined with theoretical instruction, has all-day sessions, and is the trade school proper, although many of the écoles industrielles have trade sections.

Trade training of an elementary grade is given in the following instructions:—For boys: Industrial schools, trade schools, Saint Luke trade schools, apprentice shops, trade courses. For girls: Trade schools (including trade schools proper, trade and housekeeping schools, housekeeping and trade schools), trade courses, apprentice shops.

The length of the courses in the trade school proper is from three to five years. The trade schools for girls were organized before those for boys. They offer the most advanced form of trade education for girls in Belgium. The industrial school is the largest and most important class of institution in Belgium for the training of young men. As these latter schools are supplementary to the trade and do not give regular trade instruction, and as their courses are given at hours when workmen can attend, they resemble the continuation schools of Germany. The number of these schools is rapidly increasing.

Trade instruction in Belgium is justly renowned for certain features: (1) The excellent system of economical administration and wise supervision; (2) the thoroughness of its instruction in general education applied to the various trades and also in the teaching of the trades; (3) the importance of art in all of the schools and the practical use made of it in designing in each of the trades; (4) the adaptation of all of the trade work to local needs.

The trade schools are with few exceptions under government control, although no general law governs their formation. Schools have been established by communes (écoles communales), by private individuals (écoles libres), and by provinces (écoles provinciales). Complete liberty of organization is allowed to local authorities or to private individuals, in order that the schools may be adapted to local needs. This freedom has made these schools really local institutions, conforming to no uniform model. A system of subsidizing them has been devised, Parliament voting a certain sum of money annually for this purpose, and placing it at the disposal of the minister of industry and labor. When the schools desire a portion of this appropriation they must submit a formal application, accompanied by certain details of their work which will enable the ministry to judge if the school should receive assistance.

The government exercises regular supervision over schools receiving the subsidy. Each year they must send to the ministry for approval of their accounts, their budgets for the ensuing year, and any changes in their organization or in their programmes. The supervision of these schools is most efficient. An inspector general of industrial and trade education is at the head, and under him is an expert corps of inspectors. Inspections are also made by such provincial or communal authorities as aid in the support. Religious bodies, industrial organizations, and private individuals also help these schools. Some of the schools give free instruction, some require an entrance fee, and others charge for tuition. Students who are too poor to pay for instruction or to attend it when it is free are aided in various ways.

The difference between a manual training and a trade course is very marked in Belgium. The trade schools may differ in characteristics, but they all keep strictly in view the fact that they are preparing students to earn a living in some particular branch of industry. Drawing is at the base of all instruction for girls as well as for boys, and is taught with reference to its use in particular trades. A practical general education is also considered a necessary part of the instruction in the trade, and usually occupies the first half of the day. Libraries, museums, collections of scientific apparatus for demonstration, public exhibitions, and provision for traveling scholarships are means used to develop the highest efforts of students.

The provision made for teaching girls is very thorough. *The Trade Schools* proper (écoles professionnelles) have the most complete programmes in theoretical as well as in practical work. There are at least 50 of them in the kingdom. The aim is to teach such trades as are open to girls, and at the same time to carry forward the regular school education. The trades taught are dressmaking and cutting, waistcoat- and corsetmaking, fine lingerie, millinery, artificial flowermaking, industrial drawing and ornamentation, embroidery, designing for lace and embroidery, and painting on glass, china, or silk. Commercial courses are also given. The general course, which is compulsory, includes the French and Flemish languages, arithmetic, history, geography, hygiene and domestic economy, writing, drawing, singing, and gymnastics. The instruction is excellent and has been especially adapted to the trades and to the needs of women in their households. A high place is given to domestic economy in Belgium. Its full development is in the housekeeping schools (écoles ménagères), but some of it is required in the trade schools also. The trade courses for girls vary in different schools according to the needs. The length of the course is usually three or four years, but five years are sometimes required.

The pioneer trade school for girls in Belgium is the Bishoffsheim, 94 Rue de Marais, Brussels, established in 1865. The age of entrance is 12 years, and the length of the course is 4 years. The trade courses are numerous and well taught. The courses in drawing, including designing for lace embroidery and garment decoration, painting on glass, porcelain, china, fans and textiles, and the dressmaking and the artificial flowermaking are especially notable. The reception room at this school is decorated with fine examples of porcelain tiles and china painting, and the windows are of stained glass, this work all having been done by graduate students. The Communal Trade School for Girls on the Rue du Président, Brussels, is noted for the fact that each of the

trade instructors is also the teacher of the course in design in connection with the trade. The course in embroidery and applied design is especially fine. Another Brussels communal school on the Rue du Poinçon, 26, noted for its dressmaking and commercial courses, and the Antwerp School, Rue des Architects, with its five-year courses in some of the trades, are also examples of the excellent professional training for girls in Belgium.

An advanced trade course of one year for dress designers, dressmakers, and intending teachers in trade schools is given in Brussels at the Palais du Midi, a study of the evolution of dress in all countries being a notable part of the work.

The Trade-Housekeeping Schools (écoles professionnelles-ménagères) and the housekeeping-trade schools (écoles ménagères-professionnelles) are also giving more or less time to trade work.

Apprentice Shops for teaching trade work to girls are not numerous, but are doing good work. They were opened in response to local needs rather than as a part of regular trade instruction. One of their distinguishing features is that the students after a time receive financial remuneration for their work. There are several of these schools, as the one at Bassenge for straw plaiting and straw-hatmaking; at Jemelle for lingerie and dressmaking; at Maldeghem for hand and machine embroidery and crochet work on tulle, and at St. Trond for lacemaking.

The Industrial Schools (écoles industrielles) for boys are similar to the continuation schools of Germany. They are very numerous in all parts of the country and have been organized with reference to local needs. They teach a large number of technical subjects connected with the trades which the boys follow during the day. Some of these are also day trade schools and have advanced as well as elementary work. The school at Verviers is an example, the aim being to give a training to the workmen who are employed in the numerous industries in that city, including the departments of mechanics and construction, dyeing and weaving. The Industrial School at Tournay, which is one of the oldest and most important in Belgium, also partakes of the nature of a trade school. It has no shops of its own, but it has entered into contract with local manufacturers to direct the pupils' practical education. This is a unique method of combining theoretical with practical instruction. The school gives its theoretical instruction in the early morning or in the late afternoon. The Industrial School of Morlanwelz has departments of mining, building construction, engineering, electricity, shop technology, and mechanical drafting. The organization of the school population, the equipment, the excellence of the instruction and the ability of the teaching force makes this school a power in the kingdom. The age of the students entering is from below 14 to over 20. The schools of Ghent, Seraing, Châtelet, Charleloi, La Louvière, and many other cities are adapting themselves to local industrial conditions and are doing magnificent work. Certain work in the industrial schools is also open to girls, but, with the exception of the commercial courses, they are not well attended.

The Trade School proper for boys is also well developed. Under this head are the day trade schools (for teaching actual trades), the trade continuation schools (for supplementing the day shop work), and the trade schools of fishing. Some of the day trade schools teach but one specific trade, while others teach a number. An illustration of the first class is the Brussels Trade School of Tailoring, at present housed in a part of the Palais du Midi. A four years' course is offered. The leading tailoring houses of the city show their interest in this school by contributing to its support, supplying it with order work and helping to place the graduates. The students pay a small entrance and tuition fee. They are paid a small sum for their work, and this money is placed in the state savings bank and given to the student when he completes his apprenticeship, but if he leaves the school before that time he loses the right to the money.

The H. Nicaise Trade School of Metal- and Woodworking at Ghent is an illustration of the class of school offering instruction in several trades.

The Palais du Midi in Brussels is also utilized for a trade continuation school. Jewelry work, chasing, upholstery, furnishing, printing, and many other trades are here taught in evening or in Sunday morning classes. The trade schools for fishing are placed at the seaports.

The Saint Luke Trade Schools are similar both to the day trade school and to the trade continuation school. They aim particularly to train for artistic branches of the handicraft trades. They were established by the Roman Catholics. The school at Schaerbeek, Brussels, is an illustration of this class of trade school.

Apprenticeship Shops have been organized for weaving and stone cutting and are doing successful work.

France.— France began to plan and legislate for the training of her handworkers centuries ago. The forerunner of the trade school began in 1799, but the great development of the subject has been during the last quarter of a century, following the French Exposition of 1878. The number of such schools receiving help from the government increased from 48 in 1880 to 292 in 1904, and, because of the interest manifested by the labor associations, this growth is likely to continue. France appreciates that her industrial success depends on the education of her workmen, hence the government takes a direct part in developing the system of trade instruction. Schools are provided to teach all grades of workers from the semi-skilled artisan in the ordinary trades to the engineer for the most advanced scientific and technical work.

Manual apprenticeship schools have been organized to give boys instruction in their chosen industry or to fit them for the secondary technical schools. There are four *national trade schools* (écoles nationales professionnelles), situated at Armentières, Nantes, Vierzon, and Voiron, and 32 *practical commercial and industrial schools* (écoles pratiques de commerce et d'industrie), 26 for boys which are situated in various parts of France, and 6 for girls at Boulogne-sur-Mer, Havre, Marseilles, Nantes, Rouen, and Saint Etienne. In addition to these, the municipalities of important cities have

established schools for the elementary teaching of trades, industries and arts. Religious bodies, societies, business enterprises, and private individuals, encouraged by the success of the national and municipal schools, have likewise organized instruction for the improvement of the artisan.

Government control requires that the schools receiving subsidies should all conform to certain requirements. The *Practical School of Industry* at Saint Etienne (école pratique d'industrie) may be taken as a type of these institutions. The trades of weaving, modeling in wood, machine fitting, cabinetmaking, electricity, and gunmaking are taught here. The work is on an elaborate scale, the course being four years in length. The first year is preparatory and completes the student's primary education while also giving him shop practice of various kinds to discover his aptitude for any trade. During the next three years he studies his trade practically and theoretically, and continues his general education which is closely adapted to his trade needs. Here, as in other schools, much emphasis is laid upon the study of art.

The greatest and most progressive system of *municipal trade schools* is in Paris. The Diderot School was the first one organized, having been established in 1872 for wood and metal work. The courses are three years in length, entrance being by examination. Practical work occupies the greater part of the day, but considerable time is given to drawing and theoretical instruction. By an ingenious arrangement a first year student is put between a second and third year student that he may profit by their experience. Apprenticeship is made less of a tax on the city from the fact that the products of the classes are sold. Paris has another municipal school for wood and metal work, and also the Boulle School of Furnituremaking. This latter has a four years' course, primary academic instruction, trade work, technical art, and a scientific course being included in its curriculum. Schools of printing and publishing, applied physics and chemistry, industrial art and industrial drawing are also supported by the municipality of Paris.

There are six municipal trade schools for girls in Paris. The instruction includes art, academic work, and the chosen trade, and the courses are either three or four years in length. The trades taught are similar to those in Belgian trade schools for girls. The aim is to educate for a trade, to develop the intelligence of the workers, and to teach them to be self-reliant and resourceful. The French schools execute practical order work in their departments, and every trade school in Paris has its clientèle. The model for these municipal schools is the private school begun in 1864 by Elisa Lemonnier. There are two of the Lemonnier schools in Paris at the present time. They offer courses of four or five years in length.

The training for girls in the practical schools of commerce and industry (mentioned above) is similar to that offered in the Paris municipal schools.

United States.— The United States has not many examples of the trade school proper. This class of education has not been developed in connection with public instruction, although prominent educators are urging it and small beginnings are apparent in Massachusetts and New York. Such schools as are now organized solely for trade are under private control. The New York Trade School is perhaps the largest and most thoroughly equipped. The subjects of instruction are the various building trades such as carpentry, bricklaying, sheet metal and cornice work, electrical work, house and fresco painting, plumbing, steam and hot water fitting, sign painting, plastering, blacksmithing, and printing. It was founded in 1881 by the late Col. Richard T. Auchmuty, who originated the system of instruction. It includes the theoretical as well as the practical branches of the trade. The courses are made as short as possible — usually about four months for the day classes, which provide trades for young men. The night courses aim to give additional skill to those already in the trade. The students come from all over the United States, and several thousand have received the certificate and twice as many more have been enrolled. It is claimed that this school has greatly helped the building trades and also has raised the standard of intelligence and efficiency in the working class. The Baron de Hirsch Trade School, also in New York city, offers similar trade training.

The Williamson Free School of Mechanical Trades, near Philadelphia, is a different type of trade school. The course is three years in length and the school term extends throughout the year. The pupils are regularly indentured as apprentices and live at the school. Scholastic examinations are required for admission, and there is no charge for board, clothing or instruction. The trades taught are carpentering, bricklaying, including range, furnace and boiler setting, the machine trade in all of its usual details, patternmaking, steam and electrical engineering, and steam fitting. Each student takes but one of the trades named, and his instruction in mechanical and freehand drawing is in the direction of his particular trade. The academic work continues throughout the three years, and special attention is given to ethical training that the pupils may be good men as well as good mechanics. It can accommodate but one fifth of those desiring admission.

The Wilmerding School of Industrial Arts in San Francisco has selected the building trades for its work. The course covers four years, and the aim is to send intelligent citizens as well as well-instructed workmen into the trades. The main work of the school is manual training, however, rather than the actual trade work. There is no charge for tuition, the use of tools, instruments or materials. The California School of Mechanical Arts is under the same principal, although each school is financially independent of the other. The schools are built on adjacent lots and the students can use the shops of either institution. They are free, and the latter school is open to both sexes. A competitive examination is held for entrance at the School of Mechanical Arts, and a four-year course is offered. A preliminary course of more than two years in general education and manual training is followed by the selection of some trade and apprenticeship in it. The school aims to solve a general problem of teaching various trades as an integral part of education, rather than to meet some special need of the community.

The Carnegie Technical Schools of Pittsburg, to be opened in the near future, promise to offer trade work on a large scale to both sexes as a part of a huge plan of technical instruction. The School for Apprentices and Journeymen will give night classes for those already at work. The instruction will be both theoretical and practical, with the object of turning out skilled mechanics. The scale on which this apprentice school is to be run is indicated by the fact that it will be housed in twenty large buildings. The School for Women will train girls to earn their living or will increase the earning power of women already at work.

The Manhattan Trade School for Girls in New York city trains for skilled trade work. It is a pioneer school in this class of education. The aim is to shorten the period of apprenticeship of those girls who leave the public schools to go to work, and to create in them an appreciation of the meaning and value of their trade and its relation to the work of the world. The school is open throughout the year, students may enter at any time, and each is advanced according to her ability, hence there is no definite length of course; experience has shown that it may be anywhere between six months and three years. The trades offered are: (1) Those which centre about the needle, such as dressmaking and millinery; (2) those that use foot-power and electric-power machines, including such machines as those for embroidery, hemstitching and buttonholes; (3) those that depend on the expert use of paste or glue, such as labeling, sample mounting, pocket-book and card-casemaking, library outfits, blank book covers, and novelty boxmaking. Practical academic work, as well as drawing and color, are also taught, but always with a single eye to their bearing on the needs of each trade. The tuition is free, and in especially deserving cases some financial aid may be given to pupils. It depends for maintenance on voluntary subscription and it has the cordial support of some of the foremost philanthropists, social students, and employers of labor of New York city. The Boston Trade School follows closely the plan of the Manhattan Trade School for Girls.

Schools for specific trades are to be found all over the United States. The Brewers' Schools of New York, Chicago, and Milwaukee; the Schools of Watchmaking and Repairing in Waltham, Mass., and at the Bradley Polytechnic in Peoria, Ill., and the Barbers' Schools in Nebraska and other States are instances. Shipbuilding, photography, linotype, and many other trades are taught in this class of school.

Business enterprises have also opened trade schools. Many of the institutes for dressmaking, so numerous in the large cities, were organized by some firm to teach a special system of drafting patterns. The school of Messrs. R. Hoe & Co., manufacturers of printing presses, and that of the Carriage Builders' National Association (both in New York city) are instances of large corporations training their own workers.

Night classes for teaching trades are to be found in connection with the work of social and religious bodies. The Saint George's Trade School of New York city belongs to this class. The Catholic Protectory, near New York city, is teaching numerous trades for both sexes as a part of its scheme of reformation, and similar work is done in other institutions of this character.

Certain trade or technical teaching in institutions with other educational aims is affecting the industries of the United States on one hand, and the wage-earners on the other. The pressure to introduce this work has been so great that trade classes have been offered in a variety of places, some of them receiving State or Federal aid. Much of the instruction is of a supplementary character, to take the place of apprenticeship. The technical features are usually more prominent than the special shop practice. Pratt Institute, Brooklyn, offers certain classes which resemble those of the trade continuation schools. The fundamental aim of the institute is for "industrial and technical instruction," but it has responded to the call for trade training and has opened night classes to fit boys for carpentering, machine work, plumbing, and fresco painting. Trade classes for girls are also under consideration. The technical classes are justly noted, but they do not aim to prepare apprentices for the trade. The Drexel and Spring Garden institutes in Philadelphia, the Mechanics Institute in Rochester, the Hebrew Technical institutes for both sexes, and the Clara de Hirsch Home in New York city, and the Christian associations are instances of institutions with other aims giving attention to trade instruction.

The great schools for the colored people and Indians have been foremost in inaugurating trade education as an adjunct to their academic or normal aims. The Hampton Normal and Agricultural Institute in Virginia, the Tuskegee Normal and Industrial Institute, and the Agricultural and Mechanical College in Greensboro, N. C., are examples of these schools. They have developed for both sexes almost all of the leading trades. The work is given in the most practical manner, as the shops are for productive industries and not alone for theoretical instruction. Trade teaching in these schools has been placed on a high ground and the results have justified the wisdom of the methods chosen.

Austria.— The Austrian government has developed an exceptionally logical system of trade instruction for both sexes. The legislation in regard to fostering handicrafts has been similar to that taking place in Germany and has had a great effect on the development of trade training. The schools of all grades are carefully classified and grouped. The elementary education for trade is given in Schools for Particular Trades and in the Industrial Continuation Schools. Another group, known as the Central Industrial Educational Institutions, which are most of them in Vienna, have for their function the promotion of industrial education and to serve as models for other schools of the empire. Some of these schools offer both a lower and a higher trade education in connection with their other important lines of investigation.

The Schools for Particular Trades are very numerous. There were about one hundred state schools and more than half that number of private or state subsidized schools in the report of 1899. Important examples of this class are the

schools for lace work, and hand and machine embroidery in Dornbirn and Laybach; for weaving in Reichenberg, Vienna, Schönberg, and Warnsdorf; for wood, iron, and stone work in Bergreichenstein, Bozen, Chrudim, Bruck a.d. Mur and Laas; for earthenware and glasswork at Teplitz and Oberlentensdorf; for metal work in Klagenfurth, Swiatniki, and Nixdorf, and for other trades in Gablonz, Turnau, and Karlstein.

The Industrial and Trade Continuation Schools are also extensively developed and are similar to the German schools of the same name. They have reached their highest development in Vienna. There are not only special schools for this purpose, but these courses are given in institutions with other aims.

Switzerland.— The Swiss are an industrious and practical people and their schools show the national characteristics. This country has the distinction of having provided the model for the first French trade school. As early as 1599 Saint Francis de Sales conducted a school which maintained an industrial section. The Duke de la Rochefoucould, while traveling in Switzerland, heard of the school, and, at his own expense, founded a similar one in France, which later became a National School of Arts and Trades.

The Federal government has developed an excellent system of subsidizing and supervising trade schools. The continuation school is the favorite, and they are similar in character to those of Germany, though the special trade features are not so well developed. They are found in all of the cantons and are for both sexes.

The Industrial Art Schools are giving training to apprentices in the trade, as well as advanced instruction. The cantonal School of Industrial Arts at Geneva, devoted purely to the art industries, and the Trade and Industrial Art School in Bern, combining other industries with its art work, are examples. Certain classes in both of these schools are open to women.

The Trade Schools proper cover a wide field of occupations. Of those teaching a simple trade, the watchmaking schools are the most numerous. Woodworking, embroidery, and weaving schools are also characteristic of Switzerland. Many of the schools teach several trades. The course is usually three years in length and includes such art and academic work as is felt to be necessary for the understanding of the trade. These schools have had for their models the German, Belgian, and French institutions of a similar character. The art work is generally less notable, however. The cantons of Appenzell, Bern, Geneva, Neuchatel, Saint Gall, Soleure, and Zurich have successful trade schools as well as apprentice shops.

Trade instruction for women is also well developed. Many of the trade schools include the housekeeping element, as is the case in Germany, Belgium, and France. The Trade and Housekeeping School (école professionnelle-ménagère) in Geneva offers a three year course of this character. The work produced resembles the French in precision of technique and beauty of execution, but has, perhaps, less artistic value. Of the trade schools proper a good example is the School for Ladies' Tailoring and Lingerie Making at Zurich. Pupils must be over 14 years of age and present certificates showing a good general education. Courses of three or four years are offered, which include practical work at the chosen trade, theoretical instruction concerning it, auxiliary academic subjects, drawing and drafting and at least six months' service in a salesroom connected with the school. The Bern Women's Handwork School (Frauenarbeitsschule) also gives trade training, but does not at present include art or academic work in its curriculum.

Schools for housekeepers and servants have been developed in Switzerland and give excellent courses of several months' duration. All of the ordinary work of housekeeping, cooking, baking, preserving, cleaning, sewing, repairing, washing, ironing, gardening, sweeping, and putting rooms in order is included in the course. An effort to lengthen the time of training is being made. Lenzburg, Bern, and Boniswil have good schools of this class.

The Swiss trade school is felt to have a beneficial effect on the working man and woman as well as on the industries, and is favored by the labor unions. Although the schools have not created new industries, they have been the means of developing many. The schools of wood-carving have done much to improve this trade, and machine embroidery has been, through the schools, brought prominently forward. The products of this industry are largely exported to the United States.

England.—The trade school proper has not been developed to as great an extent in England as on the Continent. Although technical education has received attention, there have until recently been but few instances where the day schools aimed to take the place of actual apprenticeship. This was due largely to the Education Act of 1889, which forbade the practice of any trade, industry, or employment in the schools. The Education Acts of 1902 and 1903 take a more favorable attitude toward trade instruction, and government aid can now be given for fostering such schools.

Supplementary trade work is largely offered in the night continuation classes, which resemble those of Germany, and attract large numbers of students. There are 4,000 of these classes in London alone. Mr. Robert Blair, of the Mosely Educational Commission, says in his report on Technical Education in the United States: "We are in the main trying to do in one institution — the evening school — what Germans and Americans are in the main endeavoring to do in two." The night classes are open to both sexes. Girls do not take much advantage of them, however, for the reason that nine or ten hours of work during the day leave but little energy for resuming workshop practice.

Although the polytechnics have done much for the industries, they cannot be cited as having heretofore fostered real trade instruction in the day classes. Such instruction, however, has recently been increasing. A late report gives the number of day trade students in or near London as 5,800. These are provided for in 35 well-equipped workrooms (principally in the polytechnics) in which 200 courses are given hearing on 53 different trades. Engineers of high rank are urging educational facilities for apprentices, workmen, and experts, equal to those offered on the continent of Europe.

Trade training for girls has not been greatly encouraged by the working class. The germ of it has been in the excellent domestic economy schools. The Women's Industrial Council of London, whose president is Lady Aberdeen, is doing much to foster trade schools for girls as a part of education. The Borough Polytechnic in London opened in 1904 a Day Trade Waistcoat-Making School for Girls. General education, art, and domestic science are included in the one-year course. The council is urging that similar day courses be offered at each technical institute in London, in order to train workers for all good trades employing women.

Italy.— Education for industrial pursuits began seriously in Italy after the national union. In 1898 vigorous reforms took place in the schools which raised the standard of teaching and reorganized the courses of study. The schools were founded chiefly by individuals. They differ widely in type, in object, and in programme. Many of the schools receive subsidies from the state as well as from the provincial or communal authorities, or from chambers of commerce, or from the savings banks. The government exercises a certain class of supervision over those schools receiving subsidies. Although there is no co-ordination between the schools, there is a response to local needs. As in other countries, there are several grades of schools. The schools of arts and trades (scuole d'arti e mestieri) train the workmen. These institutions are very numerous in the cities and small towns, and are unevenly distributed through Italy. Piedmont, Lombardy, Campagna, and Tuscany have the greater number. The instruction in many of them deals more with the technical features than with the academic and theoretical. As in other continental countries there are two classes of schools for apprentices: The day school to train workmen for trade, and the night or Sunday courses to improve workmen engaged in the industries. The Casanova Institute of Arts and Trades in Naples and the Municipal School of Arts and Trades in Genoa are illustrations of the day trade schools for boys.

Trade education for girls (scuole professionale) has received serious attention. The schools are largely attended. The parent institution is in Rome. It still remains a model for other schools. The girls enter at 12 years of age, on completing their elementary education, and continue to attend the classes for three, four or even six years. The compulsory subjects are drawing and cooking. Optional subjects are languages, needlework in all branches, laundry work, lace, and artificial flowermaking, hair-dressing, bookkeeping, and arithmetic. There is also a nurses' training school. Similar schools are to be found in Florence, Milan, Venice, Turin, Parma, Bologna, Palermo, and in some of the smaller towns.

Bibliography.— Reports of the Commissioner of Labor, Washington, especially the 8th and the 17th; courses of study and circulars of typical schools from all of the continental countries, as well as from the United States: Consular Reports of the United States; Reports of the Mosely Educational Commission to the United States, October and December, 1903; 'Education in the United States of America,' Nos. 10 and 11, published by Board of Education, England; 'Rapport sur la situation de l'Enseignement Technique en Belgique, 1897–1901'; 'American Industrial Education: What Shall It Be?' Preliminary Report of a Committee of the Society for the Promotion of Engineering Education, made at the New York meeting held July 2 and 3, 1900; Reports of the United States Commissioner of Education, 1897–8 and 1903, Vol. I.; 'Technical Training of Girls at Home and Abroad,' Women's Industrial Council (London 1905); 'Record of Technical and Secondary Education' (England), Bi-monthly Journal, published by National Association for the Promotion of Technical and Secondary Education, volume of 1901, 1902, 1903; Technical Education, England, during the year 1902–3; 'The Forum' (May 1902), Schoenhoff, 'Industrial Education in France.' See also MANUAL TRAINING; TRADE AND MANUAL TRAINING SCHOOLS IN THE UNITED STATES.

MARY SCHENCK WOOLMAN,
Professor of Domestic Art, Teachers College, Columbia University, and Director of the Manhattan Trade School for Girls.

Trade Unions, as defined by the Federal statutes, are associations of working people for the several purposes of aiding members toward greater efficiency, promoting their general intelligence, raising of funds for the benefit of sick, disabled, or unemployed members or the families of deceased members, and for the regulation of their wages and hours and conditions of labor, and the protection of their individual rights in the prosecution of their trades. The primary object was to assist members in contests with employers, and it was not for some time later that the benefit clause was added to attract members. See UNIONISM.

Trade Unions, General Federation of, a labor organization of Great Britain, aiming to unite all the British trade unions for mutual assistance and the advancement of the interests of labor. It admits any trade union to membership, but no branches or individuals. It was organized in 1899 at a special session of the British Trades Union Congress. The government is vested in a general council of representative delegates meeting annually, and in an executive "management committee" of 15, no two to be of the same trade. District committees may also be organized. Any union dissatisfied with ruling of the management committee may appeal to the council, and from the council to the vote of the general membership. The federation deals solely with industrial questions, particularly with the conduct of strikes, and aims to preserve industrial peace. All unions joining the federation pay an entrance fee of one penny (two cents) per member, and regular dues are paid on two different scales, the higher scale, sixpence (12 cents) per quarter per member, the lower scale, threepence (6 cents) per quarter per member; all payments are calculated on 90 per cent of the membership. In case of a strike approved by the general council or the management committee, unions that have belonged to the federation 12 months are entitled to a strike benefit of five shillings ($1.25) per week per member on the higher scale, and half that amount on the lower scale. Several large and representative unions have joined the fed-

eration; among them are the Amalgamated Society of Engineers, the Boot and Shoe Operatives, the Cotton Spinners, the Shipwrights, the Tailors, and the Gasworkers and General Laborers; the membership in 1902 was 419,600. See UNIONISM.

Trade Winds, one of those perpetual or constant winds which occur in all open seas on both sides of the equator, and to the distance of about 30° north and south of it. On the north of the equator their direction is from the northeast (varying at times a point or two of the compass either way); on the south of the equator they proceed from the southeast. In some places the trade winds become periodical, blowing one half of the year in one direction and the other half in the opposite direction. See also CURRENTS, OCEAN; METEOROLOGY.

Trades Union Congress, an organization of the trade unions of Great Britain, including the leading British labor organizations; it is a loose federation, without special legislative or executive functions, holding annual meetings of representative delegates for the consideration of questions affecting the interests of labor. This meeting appoints some special committees for carrying on certain business; the most important of these is the Parliamentary committee which has charge of the work of securing favorable labor legislation, and employs a paid secretary. The congress was organized in 1868, took an active and important part in obtaining labor legislation in 1871–5; and has since been largely influential in uniting the interests and keeping before the public the demands of organized labor. In 1899 it organized an auxiliary federation, the General Federation of Trades Unions (q.v.); and in 1900 another auxiliary body, the Labor Representation Committee, which includes not only trades unions, but also the Independent Labor party and the Fabian Society, and which has charge of securing the election of labor representatives to Parliament. In 1902 the congress represented 198 organizations.

Tradition, a word of various meanings. As applied to profane history it signifies knowledge of the past handed down by word of mouth from generation to generation. In this sense the line between tradition and myth is often hard to distinguish, one merging into the other. Historical tradition, however, has usually, if not invariably, a substantial foundation, and both tradition and myth are of the highest value in tracing human experience and progress both in the historic and prehistoric periods — for it should be unnecessary to state that the so-called historic period is not a uniform era, but varies with different races of mankind, according to the age at which they come within the range of historic observation.

Tradition in the religious sense holds a place not less important than in its profane meaning. It is a chief ground of doctrinal division in Christianity and also in Mohammedanism, between Roman Catholics and Protestants in the former faith, and between Sunnites and Shiites in the latter. A similar division existed among the Jews of the later Scriptural period. In the Roman Catholic view the term tradition is applied to the doctrines believed to have been communicated by Christ to his apostles, and handed down by them orally to their successors. The writings of the Fathers are regarded as witnessing these traditions. The Council of Trent teaches that the truth of Christ is contained partly in the sacred writings, and partly in unwritten tradition received by the apostles from Christ, or from the Holy Ghost, and entrusted by them to the Church, and that Scripture and apostolic tradition are alike to be reverenced. See CATHOLIC CHURCH; JEWISH SECTS; MOHAMMEDANISM; PROTESTANTISM; SHIITES; SUNNITES.

Tradu'cians (from *traduco,* transmit), a name which the Pelagians anciently gave to the Catholics because of their teaching that original sin was transmitted from father to children. More commonly the term is applied to the theory that souls are transmitted to children by the parents. Saint Augustine appears to have inclined to this belief, without committing himself to it.

Trafalgar, trăf-ăl-gär', or trā-făl'gar, a cape on the southwest coast of Spain, at the northwest entrance of the Strait of Gibraltar. It is low and sandy, and terminates in two headlands, on the east of which is a martello tower. The famous naval battle in which Nelson lost his life, after defeating the combined French and Spanish fleets under the command of Villeneuve and Gravina, was fought off this cape 21 Oct. 1805.

Tragacanth, Gum Tragacanth, Gum Tragic, a gummy exudation from the stem of various species of *Astragalus,* natives of the mountainous regions of western Asia. It comes on the market as irregular leaves or ribbon-like pieces, of a white or brownish-white color and somewhat translucent.

It swells up in water forming a gelatinous mass which is sometimes used as a mucilage. Used in pharmacy to give consistency to lozenge or pill mass. It is also used in calico printing.

Tragedy, a dramatic poem, representing an important event or a series of events in the life of some person or persons, in which the diction is elevated and the catastrophe melancholy. Tragedy originated among the Greeks in the worship of the god Dionysus or Bacchus. See DRAMA.

Trag'opan, a pheasant of the genus *Ceriornis,* closely allied to the common fowl. *C. satyra,* a common species, is a native of the Himalayas where it inhabits the forests at 8,000 to 11,000 feet elevation. The plumage is spotted, exceedingly brilliant and variegated in colors, and two fleshy protuberances hang from behind the eyes. When the bird is excited it can erect these protuberances till they look like a pair of horns. A large wattle hangs at either side of the lower mandible. These beauties and ornaments the birds are fond of displaying by various "showing-off" attitudes and movements.

Traherne, trā-hèrn', **Thomas,** English author: b. about 1636; d. Teddington, Middlesex, 1674. He was educated at Brasenose College, Oxford, took orders, became rector of Credenhill, Herefordshire, 1657, and subsequently chaplain to Sir Orlando Bridgman at Teddington. His published writings were 'Roman Forgeries,' a polemical tract; and a treatise on 'Christian Ethicks.' A prose work, 'Centuries of Meditations,' and a collection of poems, were left in manuscript. The poems, discovered in a

bookstall about 1897, were at first attributed by Grosart to Vaughan, but were claimed by Bertram Dobell to be Traherne's, and edited by him for the press. They have been described as a notable "find," and compared to the work of Vaughan and Herbert.

Traill, trāl, Catherine Parr Strickland, Canadian writer, sister of Agnes Strickland (q.v.): b. London 9 Jan. 1802; d. Lakefield, Ont., 29 Aug. 1899. She was married in 1832 to Captain Thomas Traill with whom she removed to Canada in 1833, and made her home for the rest of her life at Lakefield, Ont. Among her works are: 'The Backwoods of Canada' (1835); 'Canadian Crusoes' (1852); 'Ramblings in the Canadian Forests' (1854); 'Afar in the Forest' (1869); 'Studies of Plant Life' (1884); 'Pearls and Pebbles' (1895).

Traill, Henry Duff, English journalist and man of letters: b. Blackheath, Kent, 14 Aug. 1842; d. London 21 Feb. 1900. He was graduated at Saint John's, Oxford, 1864, called to the bar in 1868, but soon took to literature. He was connected with the *Pall Mall Gazette* (1873–80), the *Saint James' Gazette* (1880–2), *Telegraph* (1882–96), and the 'Saturday Review' (1883–94). From 1889 to 1891 he was editor of the 'Observer,' from 1898 to 1900 of 'Literature.' Among his publications are: 'Lives' of Strafford (a very original work with a new view) (1889), William III. (1888), Sterne (1882), Coleridge (1884), and others; also 'Central Government' (1881); 'Recaptured Rhymes' (1882); 'The New Lucian' (1884, revised and enlarged 1900), his best work; 'Saturday Songs' (1890), satirical verse; 'From Cairo to the Soudan Frontier' (1896); and 'The New Fiction, and Other Essays on Literary Subjects' (1897).

Train, Elizabeth Phipps, American novelist and translator: b. Dorchester, Mass., 1 Sept. 1856. She was educated at Wells College, Aurora, N. Y., and her first literary work consisted entirely of translations from the French. They include: 'The Apostate' (1889); 'Recollections of the Court of the Tuileries' (1891); etc. Her first original publication was 'Dr. Lamar' (1891), and she has since written: 'Autobiography of a Professional Beauty' (1895); 'A Social Highwayman' (1895); 'Queen of Hearts' (1897); and other works.

Train, George Francis, American financier and author: b. Boston 24 March 1829; d. New York 18 Jan. 1904. In 1850 he was put in charge of the Liverpool branch of an American business house, and three years later was admitted to partnership. Another branch was established in Melbourne, Australia, in 1853, under his supervision, and during the three years of his stay there, he introduced a sailing-ship service between Boston and Australia. In 1858 he interested English capital in the building of the Atlantic and Great Western railway; and afterward undertook street-railway enterprises in England and other European countries, but his plans, through opposition and otherwise, were frustrated. His next railroad enterprise was the building of the Union Pacific railway, ground for which was broken at Omaha 2 Dec. 1863 and the connection that linked the eastern and western extremities completed 10 May 1869. He made a tour of the world in 80 days, arriving in Marseilles, France, 20 Oct. 1870, where he organized the Commune, was arrested and imprisoned for 13 days at Lyons. In 1872 he became an independent candidate for President of the United States. He was a man of eccentric habits and extravagant speech, and in November 1872 was arrested on the charge of having published obscene literature. The passages objected to were wholly quotations from the Bible. Mr. Train was discharged from custody after having been adjudged insane by legal decision. His later years were spent in New York, where he adopted the habit of speaking only to children. He called himself "Citizen of the World," and while his title to property valued at $30,000,000 at Omaha, Neb., remained in litigation he affected a simple style of living, and spent his last years at a cheap hotel, where he died. Among his publications are: 'An American Merchant in Europe, Asia and Australia' (1851); 'Young America Abroad' (1857); 'Young America in Wall Street' (1858); 'Young America on Slavery' (1860); 'Championship of Women' (1868); and 'My Life in Many States and in Foreign Lands.'

Train Bands, a body of citizens partaking of the nature of both militia and volunteers, instituted by James I. and dissolved by Charles II. The term was afterward applied to the London militia, from which the 3d regiment of the line originated, and in which the renowned John Gilpin was a captain.

Trained Nurse. See NURSE, TRAINED.

Training, Athletic. See PHYSICAL TRAINING.

Training School for Teachers. See TEACHERS, PROFESSIONAL TRAINING OF.

Trajan, trā'jan (MARCUS ULPIUS TRAJANUS), Roman emperor: b. Italica (near Seville), in the Spanish province of Bætica, 53 A.D.; d. Selinus, Cilicia, 117. He was the son of Trajanus, a Roman commander under Vespasian. He accompanied his father in a campaign against the Parthians, and also served on the Rhine with such ability that when Nerva came to the throne he adopted the young soldier and raised him to the rank of Cæsar (97). Nerva dying a few months after, he succeeded to the throne (98). He was at that time in Germany, where he remained for more than a year, to settle a peace with the German tribes, and in 99 set out with a numerous escort to Rome. After largess to the soldiers and people he took successful measures for supplying the capital with corn. He punished and banished informers, reduced the taxes, and filled the most importants posts with men of talent and integrity. He moreover founded libraries; and under his patronage the studies were revived which had suffered from the persecution of Domitian. By the unanimous voice of the senate, he was awarded the title "Optimus." In 101 he set out on an expedition against Decebalus, king of the Dacians, who had forced Domitian to purchase peace by an annual payment of money, and after two years defeated the Dacians and returned to Rome to enjoy the honors of a triumph with the name of Dacicus (103). In this year Pliny was made governor of Pontus and Bithynia, which circumstance gave rise to a series of let-

ters between him and Trajan still extant. Among these are the epistles respecting the Christians, whom he directs Pliny not to search for, but only to punish if brought before him. In 104 Decebalus renewed the war with the Romans in pursuing which Trajan constructed a bridge over the Danube, below the modern Orsova, which was one of the greatest works of antiquity (105). He then marched into Dacia, reduced the capital of Decebalus, and turned Dacia into a Roman province. It was in commemoration of his wars in Dacia that he erected the sculptured column which still bears his name. In 114 he dedicated the Forum that he had built in Rome, and set out on a new warlike expedition against Chosroes, the Parthian. The result of this war was the reduction of Armenia to a Roman province. His war with the Parthians was completed in two campaigns, after which he sailed down the Tigris and entered the Persian Gulf. During his absence the Parthians revolted. After giving a king to the Parthians he laid siege to Atra, the capital of an Arabian tribe, but was obliged to withdraw to Syria. In the following year (117) he proposed returning into Mesopotamia, but was attacked by a disorder, which induced him to repair to Italy, leaving the army under the command of Hadrian. He had proceeded no farther than Selinus, in Cilicia, when he died, after having adopted Hadrian for his successor. His good qualities as a ruler were such that, at the distance of 250 years from his death, the senators, in their acclamations on the accession of a new emperor, were accustomed to wish that he might be more fortunate than Augustus and better than Trajan.

Trajan's Column. See ROME; TRAJAN.

Trajan's Wall, Rumania, a fortified line in the Dobrudja extending east from the Danube to Kustendji on the Black Sea, a distance of 37 miles. It is a double, in some places, a triple, earthwork on the south side of a natural fosse consisting of a narrow marshy valley. Another wall of the same name, built by a Roman legion, 105–155 A.D., extends from the Pruth east to the Black Sea.

Tramp. See MENDICANCY; VAGRANCY.

Tramways, Aerial. See CONVEYER; WIRE ROPE.

Trance, a state in which the voluntary functions of the body are suspended, and in which a dream life is carried on of more coherency than in ordinary sleep. In some cases the only external sign of trance is the length of time during which the voluntary functions are suspended. The patient is then said to be in a trance-sleep. When the trance is deeper the action of the heart and lungs is very feeble although perceptible; the state of the patient is distinguished as that of trance-coma. And when the trance is so deep that the action of the heart and lungs becomes altogether imperceptible, the body falls in temperature and no sustenance is taken, the patient is said to be in a death-trance. The state of trance is usually a consequence of violent emotion or excitement, especially of a religious nature. By those who have fallen into such a state in consequence of religious excitement, the dreams then experienced by them are often taken for revelations from another world. For the state of apparent death which sometimes takes place to such a degree as to have led to the interment of people under the supposition that death had actually taken place, see DEATH.

Trani, trä'nē, Italy, in the province of Bari, on the Adriatic, 26 miles northwest of Bari, a seaport on the southern coast. The cathedral (12th century) with handsome bronze doors and interesting crypt, and castle, are the chief buildings. Promenades occupy the site of the ancient fortifications. Trade depends upon oil, grain, almonds, wine, and figs. During the Crusades Trani flourished, and it has been the see of an archbishop since the 11th century. Pop. 25,000.

Tranquebar, trăn-kwĕ-bär', India, in Madras, district of Tanjore, 56 miles south of Pondicherry, an important seaport, with citadel and fortifications. There are two Protestant churches, a Portuguese chapel, and schools for Danish, English, and Portuguese, a reading-room and literary institute. A Protestant mission was established here as early as 1706, which was the first in India. There are some manufactures of coarse cloth. The Danish settlements, established in 1616, were purchased by Great Britain in 1845. Pop. of town 5,000, with native suburb of Poraivar 14,500.

Trans-Andine Railway. See INTERCONTINENTAL RAILWAY.

Trans-Mississippi Exposition, a popular exhibition of commercial and agricultural products held in Omaha, Neb., from 1 June to 1 Nov. 1898. The exposition covered about 200 acres. There were over 20 buildings artistically grouped and connected by vine-shaded arcades; the main buildings alone having an aggregate floor space of 500,000 square feet, exclusive of 200,000 square feet of gallery space. The exposition was a great success, industrially and financially, the total number of visitors being 2,613,374, and the total cash receipts, $1,761-, 364.18; giving a surplus of $400,000.

Trans-Siberian (trans sī-bē'rĭ-an) **Railway,** an extensive railroad system of Russia, between Saint Petersburg, Port Arthur (q.v.), and Vladivostok (q.v.), a distance of 6,677 miles across both European and Asiatic Russia. The government of the czar as far back as 1870 began to plan this great railway enterprise, realizing the possibilities of developing her vast territory to the eastward. Beginning at Moscow the work of building the railroad was rapidly extended and Orenburg was reached in 1877. In 1880, the bridge over the Volga was built and the section connecting the Volga and Obi River basins was begun. In May 1891 the first work on the real Trans-Siberian railway was begun. From that date the railway was steadily pushed forward.

In perfecting this vast enterprise Russia sent commissioners to the United States to study the American railway systems. She imported Italian workmen who had helped to build the Simplon and Saint Gotthard tunnels for the construction work. She built towns in the desert and transported whole families by the thousand to them for the work. And finally the line of track extended from her ancient capital of Moscow in the West to her newest stronghold, Port Arthur, in the East, a direct line of communication—save only for one piece, the Lake of Baikal. Rivers, with beds a mile wide, shallow and

treacherous amid shifting sand in summer, icebound in winter, raging torrents when the ice broke up in the spring, crossed the path of the railroad, but the builders had bridged them.

But Lake Baikal—the Holu Sea of Siberia—was a serious and difficult problem. With a length of 390 miles and an area of 15,000 square miles, it was directly in the way on the plateau where the railway reaches its highest elevation, 1,500 feet above the sea-level. Hills from 3,000 to 6,000 feet high surround it, rising so abruptly from the water's edge that building along their side without long tunneling is impossible. The lake itself is so deep that it could not be bridged. Its surface is 1,561 feet above sea-level, its bottom at the deepest part is 1,624 feet below, and it is subject to frightful storms. From November to April it is practically icebound, so navigation across it the whole year round is impossible. Even sledging over the ice is difficult. Under normal conditions it should be perfect. The lake begins to freeze early in November, is completely icebound by the middle of December, and the ice does not break up until May. Meantime its white covering reaches a thickness of 10 feet. The railroad has been built to the eastern and western edges of the lake and the passengers are taken across in large ferry-boats. There is no difficulty about this in the summer months. The trains from Moscow run along the banks of the Angara River to the lake and the cars are then run aboard large ferry-boats and are carried across to Myrovaya, a distance of 40 miles, where they take the railroad again on to Harbin, Vladivostok, and Port Arthur division. In the winter ice-breaking steamers have been employed and attempts have been made to construct a rail track across the ice, but the only logical method appears to be the building of a 100 mile detour around the lake at a cost of $15,000,000. The entire system from Moscow to Port Arthur was built cheaply, with light rails and wooden bridges, and naturally since the road was formally opened in 1902, it has been impossible to maintain anything like a respectable speed. The present schedule time for passenger trains is about 13½ miles an hour. This is for the through express trains. One leaves Moscow weekly for Port Arthur and reaches Vladivostok. It makes the run of 6,457 miles to Vladivostok in 18 days; to Port Arthur, 210 miles further, in an additional two or three days. Slow passenger trains leave Moscow daily, and they are a month and more in making the long journey. Breakdowns are frequent and relief slow. Freight trains average about 10 miles an hour. Notwithstanding these difficulties the road carried during 1903, according to Russian official statistics, 1,000,000 tons of freight and 1,320,000 passengers.

The Trans-Siberian railway when it reaches Manchuria, on the Chinese border line, becomes, by title only, the Chinese Eastern Railway, and diverges into two branches, almost at right angles, leading to Port Arthur and Vladivostok. Through passenger tickets are sold from Saint Petersburg to either Port Arthur or Vladivostok. The tariff or fare for the journey of 6,677 miles is as follows: first class, $128.75; second class, $87.55; third class, $46.35. The road was originally built at a cost of $172,525,000, and its importance to Russia cannot be overestimated. Before its construction the mobilization of troops at any given point would have taken weeks, while now it can be accomplished in comparatively few days. Politically, it unites the various provinces, and brings the whole country from Saint Petersburg to Vladivostok into direct touch with the central government. For the interior of Russia the opening of the railroad means that the resources of the East are at her disposal, and that she can deliver in the East her own products at a great advantage over her Western rivals. Business men throughout Europe will benefit by the mail service over the new railroad, and the Russian merchants will enjoy the advantage of quicker communication and nearness to their new markets. During the Russo-Japanese war in 1904, the Russian government despatched over 300,000 troops over the Trans-Siberian road within a period of 90 days, together with enormous quantities of provisions and supplies.

Transcas'pian Railway, an important line of railway, beginning at Uzna Ada on the Caspian Sea, and extending as far as Merv in 1886, Samarkand in 1888, and to Tashkend and Andijan in 1900. The Amu-Darya (Oxus) is crossed by a wooden bridge 6,804 feet in length.

Transcaucasia, trans kâ-kā'sĭ-a, Russia in Asia, the region extending between the Caucasus Mountains on the north, and Turkey in Asia, and Persia on the south. The provinces on both sides of the Caucasus, with the added Armenian districts, constitute Caucasus or Caucasia in the widest sense, and are under one central authority, with 11 minor provinces; but the territory is sometimes divided into North Caucasus, Transcaucasia and Armenia. The chief town is Tiflis. Transcaucasia comprises eight provinces; total area 94,182 square miles; pop. 5,516,139.

Transcendental Philosophy, that type of philosophy which holds intelligence to be the creative activity in the real world. To understand the use of the term transcendental during the past century, we must refer back to Kant, and his distinction between transcendental and transcendent. Kant applied the term transcendent to such ideas as he believed were beyond the range of any possible experience. On the other hand, he designated as transcendental those elements which were necessary constituents of experience, but which could not come from sense-perception. These transcendental elements are the organizing principles or concepts which are the inherent property of the mind as an active intelligence. Such organizing principles could never be furnished by sensation; for it is only by their agency that the material of sensation is built up into a comprehensible experience. Thus Kant maintained that the world of actual experience is the result of our own mental construction, and consequently that this world is formed according to the laws of thought. Just because it is such a thought-construction Kant did not believe that the world of our experience had true reality. This true reality, he affirmed, exists beyond the world of experience and we can know nothing of it except its existence. Thus for Kant the transcendental represented that activity of intelligence which is instrumental in the construction of human experience, but not in production of reality. Kant's successors of the Idealistic School (Fichte, Schelling, and Hegel)

rejected his theory of an ultimate reality beyond experience, and held that the true and only reality was given within the unity of experience. Since the world of experience is formed according to the active principles of intelligence, these transcendental principles become, in this case, active not only in the construction of experience, but also in the construction of reality. Thus in the first half of the last century, transcendental acquired a broad and important meaning, signifying, in general, a spiritual interpretation of the universe, and more strictly, that philosophy which affirms the activity of reason or intelligence, in the nature and development of reality. Chiefly through the writings of Coleridge and Carlyle, the ideas of Kant and his successors were made known in England. Through the same medium the transcendental philosophy became known to America, and inspired a definite movement in New England. This movement, called New England Transcendentalism, was a reaction from the prosaic orthodoxy and utilitarianism of the time toward a deeper and more ideal interpretation of reality. W. E. Channing and Ralph Waldo Emerson were prominent in the inauguration of this movement; and there became associated in it a remarkable coterie of congenial spirits. The Transcendental Club, founded in 1836, and Brook Farm, a social community organized in 1840, were immediate results of the movement. The 'Journal of Speculative Philosophy,' founded in 1871, and the Concord School of Philosophy (1879) were later expressions of the same. The philosophy of this school was not systematically set forth, nor was it derived wholly from German sources. It was an idealism, rather vague, and often incoherent, which owed almost as much to the philosophy of Plato and the Neo-Platonic mystics, as to modern thought.

Consult: Kant, 'Critique of Pure Reason'; Caird, 'Hegel' (Blackwood Phil. Classics); Coleridge, 'Biographia Literaria'; Carlyle, 'Sartor Resartus'; Emerson, 'Essays'; Frothingham, 'Transcendentalism in New England.'

H. W. Wright,
Cornell University.

Tran'sept, in architecture, the transverse portion of a church which is built in the form of a cross; that part between the nave and the choir which projects externally on each side, and forms the short arm of the cross in the general plan.

Transfer Paper. See Paper and Paper-making.

Transfigura'tion, Feast of the, a festival on 6 August, instituted in honor of the Transfiguration of Christ. It is said to have been instituted in the West by Pope Calixtus III. (1455–8), but is mentioned in the 9th century.

Transfiguration, Sisters of the. See Orders, Religious.

Transfu'sion, in medicine, the operation of transferring blood (defibrinated) from a receptacle to the vein of a patient — indirect or mediate transfusion; the transmission of blood from the vein of the giver to that of the patient — direct or immediate transfusion; also the intravenous or subcutaneous introduction into the body of any substance, as saline solution, etc. The transfusion of blood from the veins of one living animal, to those of another, or from those of a man or one of the lower animals into a man, is a very old operation, having been first performed in 1492. Although it has been used many times with success in restoring the vigor of exhausted subjects, it has frequently failed, owing to the injection of air, the too rapid distention of the heart, phlebitis, thrombosis, and embolism. Blood-transfusion has been mainly used in cases of exhaustion from hemorrhages. In recent years the tendency among medical practitioners has been to substitute the injection of normal salt-solution for that of blood. It seems to be proved "that for efficiency, freedom from danger, and ease of administration, the subcutaneous injection of normal salt-solution, six drams of sterilized salt to one gallon sterilized water, at a temperature of from 110° to 120° F., excels any and all things that have ever been used to relieve those suffering from shock and from the effects of hemorrhage, and as an eliminant in septic and toxic conditions." The possible dangers attending the intravenous injection of normal salt-solution are those of blood-transfusion; but "when life is almost extinct and the patient's vitality so low that the probability of absorption from the subcutaneous spaces is slight, or where the tissues are œdematous, then the solution should be injected into a vein."

Transition Rocks. See Palæozoic.

Transit Circle. See Meridian Circle.

Transit Instruments. See Astronomy, Practical.

Transit of Venus. See Venus.

Transits. The passage of a heavenly body between the observer and another more distant body of larger apparent surface is called a transit. The most frequent phenomena of this kind occur in the case of the satellites of Jupiter. The latter is many times larger than any of its satellites and it happens very frequently that an observer with a good telescope can see the passage of a satellite of Jupiter passing over the disk of the planet. The times of these transits are predicted in the astronomical ephemeris. The transits of the inner satellites occur at nearly equal intervals of 1 day 18½ hours; and it takes about 2 hours and 27 minutes for the satellite to cross. The transit can be observed only when Jupiter is above the horizon and the sun below it, so that only about one transit in five is visible at any one place. Since the satellite is an opaque body, it casts a shadow which may be thrown upon the planet. To an observer on the latter, if the shadow passed over his position, there would be a total eclipse of the sun. The shadow appears to us as a small dark spot passing over the planet near the position of the satellite.

The satellites of all the other planets are either too small or too distant to admit of their transits being observed. For the most part they are entirely obliterated to our sight by the brilliant light of the planet itself when they approach the latter.

The planets Mercury and Venus, having orbits inside that of the earth, will be seen in transit across the sun whenever they pass in a direct line between the earth and sun. If the planes of their orbits coincided with the ecliptic, this would happen at every inferior con-

junction of the planet. But, as a matter of fact, there is a certain inclination of each of the orbits to the ecliptic. Imagining the latter plane to surround the sun, extending out to the earth, the orbits of the inferior planets each intersect this plane at a small angle at two opposite points. The line adjoining these points passes through the sun and is called the line of the nodes. If, when the planet is in inferior conjunction, the earth happens to be on or near this line, a transit of the planet will be seen across the sun's disk. In the case of Mercury the earth passes the line of nodes about 8 May and 10 November of each year. It is only within a few days of these times that transits of Mercury can be seen. When such a transit does occur, we must generally wait several years before there is another. The interval between those which occur in November is generally 7 or 13 years. The interval between the May transits is generally 13 or 20 years. The following is a list of the transits of Mercury which are to occur during the 20th century with the eastern standard time of the middle of the transit:

Year	Date	Eastern Standard Time
1907	Nov. 14,	0 h. 7 m. P. M.
1914	Nov. 7,	0 5 P. M.
1924	May 7,	1 34 A. M.
1927	Nov. 9,	5 45 A. M.
1937	May 10,	9 22 A. M.
1940	Nov. 11,	11 22 P. M.
1953	Nov. 14,	4 53 P. M.
1957	May 5,	1 12 A. M.
1960	Nov. 7,	4 54 P. M.
1970	May 8,	8 22 A. M.
1973	Nov. 9,	10 34 A. M.
1986	Nov. 12,	4 9 A. M.
1993	Nov. 5,	3 59 A. M.
1999	Nov. 15,	9 40 P. M.

The earth passes the line of nodes of Venus on 6 June and 6 December of each year. But it very rarely happens that Venus is so near the node on these dates that a transit will be seen. Accordingly the transits of this planet occur at much longer intervals than those of Mercury. For many centuries past and to come there are four transits in every 243 years. The condition which governs their recurrence is that 13 revolutions of Venus require almost exactly eight years. The result is, when Venus and the earth happen to pass a node at nearly the same time, they will both pass nearly the same point eight years afterward. But at the end of the second interval of eight years the conjunction will occur so far from the node that no transit will be visible. The result of this is that the transits occur in pairs, eight years apart. The interval between the last transit of one pair and the first of a pair following is either 105½ years or 121½ years. The dates of these transits for several centuries past and to come are as follows:

1638 December 7	1882 December 6
1639 December 4	2004 June 8
1761 June 5	2012 June 6
1769 June 3	2117 December 11
1874 December 9	2125 December 8

It will be seen that the whole 20th century will pass away without the inhabitants of the earth having an opportunity to observe this phenomenon. But the approach of the transits of 2004 and 2012 can be watched in thought through successive cycles of eight years. An inferior conjunction of Venus occurred on 8 July 1900. At that time the earth, having passed the node on 5 June, was 34° distant from it. In consequence, there was no transit, but Venus, could it be visible so near the sun, would have been seen passing below the sun. Eight years later the same thing will repeat itself, only the conjunction will take place between two and three days earlier, namely, on 5 July 1908, the earth being between two and three degrees nearer to the node than it was on 8 July 1900. The conjunction will go on repeating itself in 1916, 1924, etc., two or three days earlier at each repetition, and a little nearer to the node, until 2004, when there will be a transit. At the conjunction of 1908, the earth will be on the opposite side of the node, but near enough to it for another transit. Then there will be no more transits for more than a century.

Transits of Venus derive their astronomical celebrity from the belief entertained in former times that they afforded the best method of measuring the distance of the sun from the earth. The measures were made by the principle of parallaxes. An observer, as far north as he could station himself to observe the transit, would see Venus pass over the sun's disk on a line apparently further toward the south than an observer who was in the southern hemisphere. The comparison of the observations made by observing the times which, at each station, it took Venus to complete its transit, afforded the means of calculating the parallax and the distance of the sun. The feasibility of doing this was pointed out by Halley about the middle of the 17th century, and, on his proposal, expeditions were sent by various nations to points in the northern and southern hemispheres to observe the transits of 1761 and 1769. This was a period of great unrest, and several of the expeditions became celebrated through the adventures to which they gave rise. In 1769 Mason and Dixon, the English astronomers, started on a ship of war for their station in the southern hemisphere, but were attacked by a French frigate and were compelled to return to port after a severe battle. The King of Denmark sent Father Hell, a Jesuit astronomer of Vienna, to a point near the North Cape, where very successful observations were made. But doubts were thrown on the genuineness of his record, which were not settled for more than a century. The transit of 1769 was visible in the Atlantic States, and observations upon it were made under the auspices of the American Philosophical Society, held at Philadelphia. The most celebrated of the Philadelphia observers was David Rittenhouse.

When the observations of these transits were worked up, it was found that they would not give so certain a result as was anticipated. No two observers seemed to agree as to the exact moment at which Venus had entered wholly upon the disk of the sun. The entrance was not seen in the sharp and precise way it should be seen, but seemed to be uncertain, through a

dark haze forming on the two limbs at the moment when Venus was entering. The outcome of the affair was that it was more than 60 years after the last transit before a result had been worked up from it which was supposed to be quite satisfactory. This was done by Encke in 1822. The distance of the sun which he derived was, in round numbers, 95,000,000 miles. This distance appeared in all astronomical text-books and was almost uniformly accepted for 30 years.

Then it was found by Hansen and others that there was something wrong in this determination, and it was claimed that the distance was more than 3,000,000 miles less than Encke had found it. The methods of making this determination are stated in ASTRONOMY, THEORETICAL. It has since been shown very clearly that a great error did really exist in Encke's determination, though it was not so great as had at first been supposed.

Notwithstanding this failure of the method, it was supposed that with the greatly refined telescopes and better means of observation of recent times, the transits of 1874 and 1882 could be utilized advantageously in the same way. Accordingly, on each of these occasions, expeditions, fitted out with the best instruments that science could provide, were sent by various nations to the best stations for observation in various parts of the world. But when the observations were worked up, the results were again found to be unsatisfactory, and the observations turned out to be more useful for determining the position of Venus, and the slight change from century to century of its node, than for determining the distance of the sun.

SIMON NEWCOMB.

Transmigra'tion of the Soul, or **Metempsychosis,** the belief of many races and tribes at all times, to the effect that the soul after the death of the body passes into the bodies of the lower animals or other human bodies, or, it may be, of plants or inanimate objects. Among various tribes of Africa and America the belief is found entirely unconnected, so far as can now be discovered, with any ethical notions. In the teaching of the Brahmanic Hindus, among whom the doctrine can be traced further back than in any other race, it 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. By them the migration of a human soul through various bodies is regarded partly as a penance and partly as a means of purification. The doctrine of transmigration is accepted by the Buddhists also, but with them the ultimate goal of the soul is not absorption in the Deity, but annihilation, Nirvana. The southern Buddhists hold the doctrine with another important difference. They do not believe that one soul undergoes a variety of migrations, but that after the death of the body another soul which derives its existence from the one that inhabited that body begins its life in another body. With this doctrine is connected the regard which the Indians have for animals. The doctrine also formed part of the secret teaching of the Egyptian priests, who believed that the soul had to continue 3,000 years after death in the bodies of animals before it could reach the habitations of the blessed. It was probably from the Egyptians that the doctrine passed to the Greeks, among whom it was never generally current, but was confined to the mysteries and some philosophic systems. Pythagoras is the first Greek philosopher in whose system the doctrine occupied an important place, but Thales and Pherecydes are both said to have preceded him in teaching it. Plato in his 'Phædo' advances some probable arguments in favor of the doctrine, propounding the speculation that souls return into the Godhead after a cycle of 10,000 years, during which they have to abide in the bodies of animals and men. Plotinus treats of two kinds of transmigrations, a passage of souls from invisible ethereal bodies into earthly ones, and from earthly into other earthly bodies. Among the Romans, Cicero alludes to this doctrine, and Virgil, and more especially Ovid, in many passages give it a poetical treatment. Cæsar 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. They treat the subject of transmigration in their peculiar way, maintaining that God created but a certain number of Jewish souls, which therefore constantly return on earth as long as Jews are to be found here, and are sometimes made to dwell in the bodies of animals for the sake of penance, but at the day of the resurrection will all be purified, and in the bodies of the just revive on the soil of the promised land. The doctrine of the transmigration of souls has also been held by various Christian sects, for example, by the Carpocratians, Valentinians, and Manichæans. It was also professed by the Arabs before Mohammed, but was not admitted by him into the Koran. Even some modern European writers have inclined to this doctrine. Among these may be mentioned Lessing in Germany, and Pierre Leroux and Jean Reynaud in France. The reasoning of Lessing in support of the doctrine amounts to this, that the human soul can acquire the infinite conceptions of which it is capable only in an infinite series of successive existences, that the soul in one condition may supply the deficiencies of another, and thus gradually fit itself for a perfect life. Such a theory, however, is radically different from the ordinary doctrine of transmigration, inasmuch as it does not imply successive existences on earth.

Transmission of Power, Long Distance. The first practical test of long-distance transmission of power was given at Frankfort, Germany, about 1890, and since then the advance has been very rapid. All developments in power transmission have been made within the past 30 years, for it was only about 28 years ago that the first practical dynamo was built. From that time to the present, the application of electricity to various distances has been tried successfully. In 1890 it was determined to test the possibility of transmitting power from Lauffen to Frankfort, a distance of 110 miles, by use of the polyphase system. This experiment marked an epoch in the commercial development of electricity, for it demonstrated the utility of high voltages in the transmission of power, and also

the success of polyphase currents. It has since been shown that, considered from an engineering standpoint, there is practically no limit to the distance to which electricity can be transmitted. The only consideration is an economic one. If the location of a place is such that water power is not directly available, and there is great demand for power for which a high price can be paid, then it will be profitable to transmit over a long distance. Power at the present time has been transmitted up to 150 miles with profit. In mining localities it has made possible the extraction of low-grade ores which could never have been mined profitably had steam been the only power available, owing to the great cost of coal.

Before the introduction of electrical transmission, it was possible to distribute energy to short distances by various methods; but no system offered a long-distance transmission for all purposes. By means of dynamo-electric machines, energy obtained from either coal or water power may be transformed into electrical energy; it may then be distributed and again transformed into light, heat, or mechanical power. The limits to the distance of this distribution are determined only by the conditions of economy and safety. The first long-distance transmission plant was operated by continuous currents, for the simple reason that polyphase currents were then unknown. The continuous-current system has some advantages, but these are more than offset by its disadvantages. The great advantages of this system lie in its small cost for copper, and in the absence of induction effects. Considering the relative cost of copper in the line for a given amount of power transmitted and for a given maximum potential between the conductors, we have the following comparison:

Continuous-current	100
Single-phase alternating	200
Two-phase alternating	200
Three-phase alternating	150

Thus we see that under the conditions given, there is a great economy of copper in the continuous-current system.

High voltages, however, are necessary for long-distance transmission. These high voltages would make it impossible, without reduction in the voltage, to distribute the power at the receiving end. With a continuous current, reduction of voltage can be accomplished only by using a rotary commutator of some kind. As this is of course very objectionable, it makes the use of continuous currents practically impossible. The great advantage of the alternating-current system is that the voltage can be changed without the use of rotating apparatus. A low-voltage machine may be used, the current being transformed to one of high voltage for transmission purposes, and then distributed again at low voltage by means of transformers. The great difficulty in this system lies in the fact that the inductance of the circuit causes the current to lag behind the electromotive force. This decreases the amount of energy transmitted by a given current at a given voltage, and it also causes a drop in voltage along the line. The inductance of the circuit can in some measure be compensated for by the use of condensers or synchronous motors. Theoretical considerations show that the influence of capacity upon long, aerial, bare conductors used for the transmission of energy to a distance by alternating currents is, under proper conditions, of so entirely subordinate a magnitude that it need not be considered in the designing of electrical transmission.

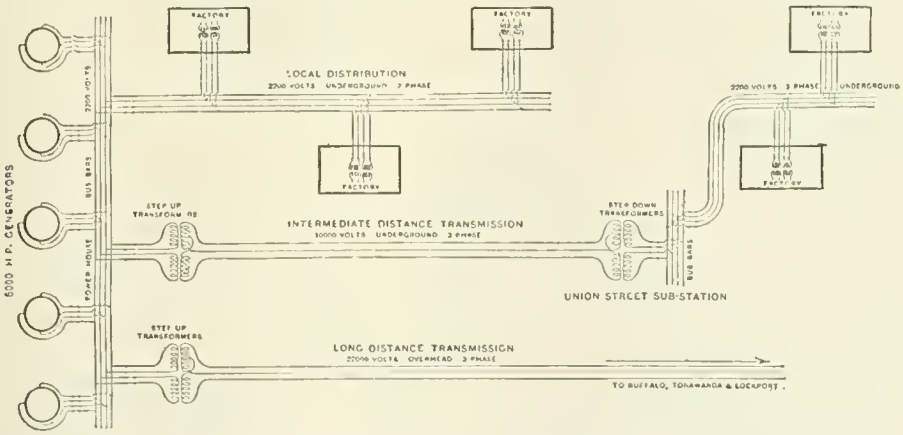


Diagram illustrating general scheme of power distribution, Niagara Falls Power Company.

The distribution of electrical energy from the generating plant to the lamps, etc., in a circuit, would seem at first glance to be a simple matter; but in fact the problems involved are of great scientific and technical interest. The designing and laying out of a system of conductors to maintain a practically constant pressure over a large area requires engineering skill of no small order. In long-distance transmission the cost of the conductors is almost always larger than the entire cost of the remainder of the plant.

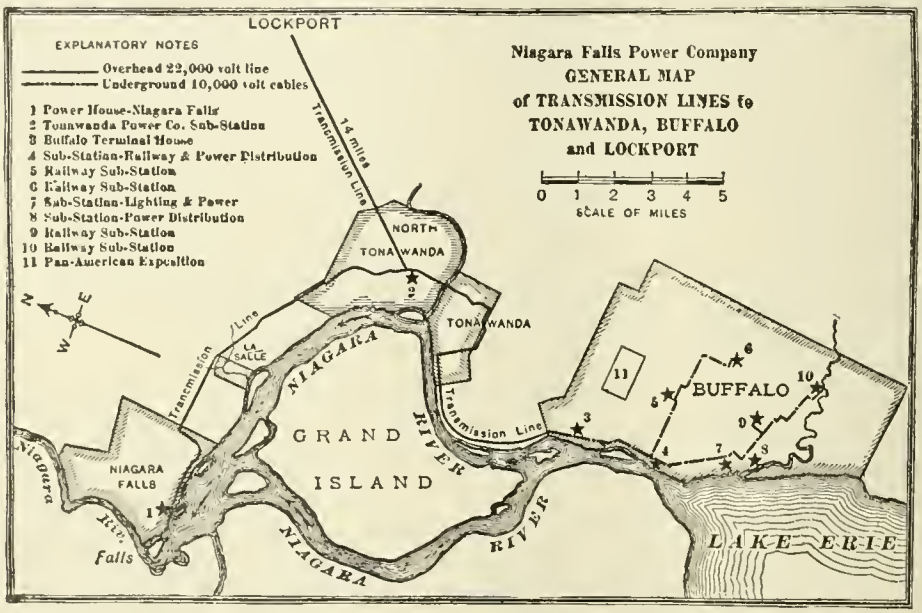
The three-phase system is cheaper for long-distance transmission than one using either single-phase or two-phase currents. Continuous currents are the cheapest of all, but, as already said, are useless for very high pressures. The selection of a system for long-distance transmission of power will depend mainly upon the maximum voltage. If the pressures are such as can be obtained from continuous-current dynamos, there is no doubt but that the continuous-current system is the cheapest and best. But if extra high voltage is advisable, then the three-

phase system will generally prove the cheapest. The motto of the electrical engineer to-day is: Alternating current for transmission; direct current for local distribution.

The most notable instances of long-distance transmission up to the present time are found at Niagara Falls and at several points in South Africa and Southern California. In the largest scheme for the distribution of power ever undertaken, namely, from the Niagara Falls, alternating currents in two phases are used. The first distribution was made in 1895 to works located in the vicinity of the plant of the Power Company, and in November 1896, power was transmitted to Buffalo, 20 miles away, and successfully applied in the operation of trolley lines. Since that time the "harnessing of Niagara" has made substantial progress, until to-day within the region extending westward to Saint Catharines, Ontario, eastward to Lockport, N. Y., and as far southward as South Buffalo, practically

The climate of Southern California is very favorable for long-distance transmission. The plant at Colgate, located on the North Yuba River, and transmitting power over 150 miles to Oakland, near San Francisco, has been wonderfully successful, and is being widely studied and imitated both in America and abroad. The power house at Colgate has a capacity of 15,000 horse-power, represented by three generating units of 3,000 horse-power each, and four units of 1,500 horse-power each — seven in all. These dynamos are of the three-phase alternating-current type.

The last century began with Volta and his little battery. The new century starts with the wonderful achievement of the transmission of 80,000 volts over a distance of 200 miles. A few years ago 10,000 volts was the maximum, and was considered difficult to handle. To-day 40,000 is practically standardized, and 60,000 is not unusual. Instead of high voltages being



every municipal lighting plant and every street-car motor in use is supplied with power developed at the great cataract by the Niagara Falls Power Company.

In Africa, it is proposed to harness the Victoria Falls of the Zambesi River. These falls furnish an inexhaustible water power, being nearly a mile in width and 420 feet in height. From the power obtained from these falls, it is proposed to operate the Cape-to-Cairo Railway for a distance of 150 miles, both north and south of the falls; to operate the recently discovered copper deposits, which lie within 150 miles to the north; to work the coal fields in the vicinity, and eventually to transmit power down to the Rand to work the mines in that now historic district of the Transvaal. It is said that there is practically no limit to the power that can be developed, for even in dry seasons the river is two or three feet deep above the falls and a mile wide.

dangerous, they are really safer than moderate voltages, because they are looked on as sources of danger and are carefully installed, being carried over private rights of way and carefully guarded.

Only the imagination can grasp the variety of work which a system like that in California is called upon to do, for it includes all kinds of lighting and every sort of power application, from the running of cars to the operation of flour-mills; from the driving of mine stamps to the propulsion of the little sewing-machine at work on the making of a bride's trousseau. The success of long-distance transmission will revolutionize society in the next hundred years. Our cities will be cleaner; large railroad systems will be operated from a central source of supply; waste water powers will be utilized, and there will be a general application of electricity to all kinds of mechanisms and to many social and domestic uses. Long-distance transmission of

power is not only an accomplished fact, but has already shown substantial evidences of an effect on business and society that augurs much for the future. See also POWER.

HENRI F. CHADWICK, S. B.,
President of the Casino Technical Night School, Pittsburg, Pa.

Transpadane (trans-pā'dān) **Republic.** See CISALPINE REPUBLIC.

Transpiration, in physics and chemistry, a name first applied by Graham (in 1846) to the phenomena that are observed when a gas discharges into a vacuum, through a capillary tube, and since extended so as to include the passage of any kind of a fluid, whether gaseous or liquid, through a capillary tube, from a region where the pressure is high, to one where it is low. The laws governing the transpiration of fluids are still very imperfectly known. They are quite different from those that govern diffusion phenomena, and also quite different from those that hold in the case of the *effusion* of gases through a minute hole in a thin partition. In transpiration, the viscosity of the fluid appeared to be the chief factor in determining the quantity of fluid traversing the tube in a given time. The temperature of the fluid is also of much importance. Water, for example, will transpire through a given tube 2½ times as rapidly at 113° F. as at 41° F., the conditions of the experiment being supposed to be identical in all respects save as to temperature.

Transplanting, the process of establishing plants in new quarters, one of the most important operations of horticulture, agriculture and forestry, since it permits large numbers of plants to be grown during their early stages in very restricted areas, thus economizing the labor entailed in their cultivation until they are able to care for themselves. The operation is, therefore, in constant use in greenhouses, nurseries, etc., where it occupies a very large part of the time of the workers. And for forestry work hundreds of thousands of seedling trees are transplanted annually.

The operation may be performed at any season provided proper care is exercised in manipulation. But there is with each species of plant a season at which success is more certain. With evergreens this season is in the spring just before growth starts; with deciduous subjects the autumn, after the leaves have fallen, is often as good as the spring, but a great many deciduous plants may be transplanted during the growing season. Usually, however, only small herbaceous plants are transplanted while in active growth and then only when prepared for such operation by being grown in gardens or beds with this end in view. Such preparation is necessary since the operation, so far as the plant is concerned, is always violent because, even when most carefully performed, a large quantity of the roots are destroyed, and this loss is the greater as the plant is larger and more firmly established. Hence, the smaller the plant when removed, the more likely is it to become re-established. Trees, shrubs and herbaceous perennials which have not become active in the spring or have ceased activity in the fall, are less likely to suffer because their active roots have either not formed or have ceased to act. The plants should always be removed with as much of the root-system as possible, be exposed to the air and sun as short a time as possible and replanted in soil at least as moist as that from which they have been taken; if more moist but not wet, so much the better. Since the loss of feeding roots will curtail the supply of water absorbed, the leaf surface must be reduced considerably. In many instances one half is considered satisfactory, but with fruit trees, vines, and ornamental shrubs, two thirds or even more is frequently cut away from the tops. This top pruning is generally done after the plants have been set, because any injured twigs may then be removed and there is then less danger of injuring the buds which are counted upon to form the top. Always the soil should be pressed firmly about the roots, the larger subjects being made firm by tramping the soil down hard with the feet.

Many factors exert an influence upon transplanting. In arid regions, and in places where the winds are dry or prolonged, the operation is less successful than where reverse conditions prevail. Many plants which have tap-roots can not be transplanted successfully after they have once become established; hence, the necessity of transplanting them when very small and the advisability in many cases of cutting off the tap-roots. These plants and others that are slow to produce roots are often transplanted several times in the nurseries to develop a more extensive root-system near the surface. Stocky plants almost invariably give better results than attenuated or weak ones. And plants which have been inured to the temperature of the outside air succeed where plants not so "hardened-off" from greenhouse or hotbed conditions will almost invariably fail or suffer serious check. The weather at the time of the operation is also an important factor. If cool, cloudy or showery weather succeeds the transplanting, the chances of success not only in the operation but in the crop (if the plant is an economic) are greatly enhanced. And if the soil be freshly prepared so much the better. Except in dry weather it is inexpedient to water newly set plants; but when this is done water should be given in abundance at the base of the stem, and after it has soaked down the surface should be pulverized to hold the moisture in the soil. The watering is best done in the evening and the pulverizing in the morning.

For the transplanting of cabbage, tomatoes, sweet potatoes, strawberries and other field-crops special machines have been devised. They usually consist of a furrow-maker, a distance-indicator, a plant-setting device, a tank for watering the individual plants as set, and two seats for the boys who place the plants alternately as needed. The whole is mounted on wheels and drawn by a pair of horses. The position of the next row to be planted is indicated by a marker. These machines are widely used and have been found to do excellent work with great rapidity and economy.

The transplanting of large trees is frequently practised for producing quick effects in parks. The subjects chosen are always such as have grown remote from other trees, first because the labor of cutting roots is less, and second because the tree is more shapely. Trees which have grown in groves and forests are rarely selected because their trunks are frequently too

long. The lower and the more bushy the top the better, because the mechanical appliances required are less powerful and costly and because the necessary pruning of the top after setting can be done with least injury to the form of the tree. If such trees may be obtained from shallow soil, so much the better, because the roots will then be near the surface. Very sandy soil is, however, apt to crack and break off when frozen — the condition in which such operations are generally performed. Trenches are dug as far away from the trunk as seems advisable, with large specimens 15 feet or more radius is common. The roots exposed are held up by ropes and are sometimes covered with damp straw or moss and burlap. The tree is lifted upon trucks after the excavation beneath it is complete and the ball of earth with the roots is transported to new quarters. The practicable limit of weight for such specimens seems to be about 30,000 pounds. Such specimens of maple, elm, and other hardwood trees have a diameter of about two and one half feet. When being set in its new position the earth should be shoveled in gradually after the roots are in place and abundant water should be applied to insure the complete filling of every cranny. Tamping the soil around the roots with small rods is also widely practised. It is doubtful if such operations are in the long run entirely satisfactory when considered in the light of the expense, but as in the case of ordinary transplanting necessity demands them.

Consult: Bailey, 'Cyclopedia of American Horticulture' (New York 1900–2).

M. G. Kains,
Crop Expert.

Transport, a ship or vessel employed by a government for carrying soldiers, war stores, or provisions from one place to another. At the beginning of the Spanish-American war the United States had no ships of this class. A number of coastwise craft were purchased and hastily transformed into transports on which troops were shipped to Manila and other points. When the war closed the United States government fitted up a number of these vessels as model transports. In the war between Russia and Japan in 1904, the Japanese transported almost their entire army to Korea; some of her expeditions requiring as many as 100 transport ships for this purpose.

Transportation, (1) A punishment formerly awarded in Great Britain for crimes of a serious description, but not entailing the penalty of death. It varied in duration from seven years to the term of the criminal's life, according to the offense. The convicts were sent to Australia, Tasmania, and Norfolk Island. In 1857 transportation was superseded by penal servitude, but it was only in 1868 that transportation to western Australia actually ceased. (2) A general name for the movement of passengers or freight from one point to another, by rail, road or water. Transportation will be found fully treated in various articles under Railways; see also American Merchant Marine; Common Carrier; Steam Vessels.

Transubstantiation. The real substantial presence of the body and blood of Christ in the Eucharist is one of the fundamental doctrines of the Roman Catholic Church, and the mode or nature of this mysterious presence which is also a matter of doctrinal belief, is expressed by the technical theological term "Transubstantiation." The word seems to have been first used by Hildebert, bishop of Tours (1057–1134); it afterward became current in the Scholastic period and was solemnly adopted and approved by the Council of Trent (Sess. 13, Can. 2). In controversy exception has been sometimes taken to the term as being unscriptural and relatively new, but the real issue is concerning the doctrine that it serves to express, for if the traditional Catholic belief in the Real Presence be true — belief which was never seriously called in question before the Sacramentarian controversy of the 16th century — it must be granted that considering the system of philosophy according to which the entire scheme of scholastic theology was built up, no more appropriate word could be found to convey the idea than "Transubstantiation," as is shown by the use of the cognate words transformation, transfiguration, etc. Like the words *ὁμοούσιος* and *θεοτόκος* which in earlier controversies became famous as epitomizing the specific points of doctrine in dispute, the term "Transubstantiation" embodies the distinctive teaching of the Roman Catholic Church concerning the mystery of the Eucharist. In defining the traditional position on this point against the various new views advocated by the Reformers, the Council of Trent (Sess. 13, ch. 3, 4 and Can. 2)* describes transubstantiation as "the changing of the whole substance of the bread into the body, and of the whole substance of the wine into the blood of Jesus Christ, the appearances of bread and wine alone remaining." This doctrine, as explained by theologians, involves the Aristotelian and scholastic theory concerning the physical nature of bodies. These are supposed to contain two distinct and even, absolutely speaking, separable elements, namely, the underlying substance, and the accidents by which the substance is variously modified (for example, size, shape, weight, color, taste, etc.). Substance, according to the same theory, consists of two essential elements or principles, one passive and indifferent, called the matter (*materia prima*), the other active and determining, called the substantial form. The matter is supposed to be the same in all bodies, and the specific nature and characteristics of each one are determined by its form. Thus, every species of body inanimate or living, including man, has its own substantial form whereby it is specifically constituted, and differentiated from all other species, and when one substance or body is changed into another (for example, wine into vinegar), the process is understood by the Scholastics as the passing away of one form (that of wine) and the succession of a new one (that of vinegar), while the material element which is the subject or basis of the change, remains the same. This substantial

* The doctrine of Transubstantiation had already more than once been the object of authoritative declaration on the part of the Church, namely in a council held in Rome under Gregory VII. 1079 A.D.; in the Fourth Lateran Council (1215); in the profession of faith sent by the Council of Lyons to Michael Palæologus (1274); in the Decree for the Armenians which emanated from the Council of Florence (1445) etc.

change is therefore technically called transformation. No process of natural change from one thing to another was supposed to involve both elements of substance (matter and form), but such being the miraculous change recognized by tradition and the theological schools in the mystery of the Eucharist, it was aptly termed transubstantiation. According to this doctrine, in virtue of the divine power attached to the words of consecration, the entire substance (both matter and form) of the bread and wine ceases to exist, and in its place succeeds that of the body and blood of Christ. The accidents or appearances remain as they were before, but they do not adhere to, or modify the body of Christ as they did the substance of the bread; they are sustained miraculously without any connatural subject of inhesion, and in all respects they follow the same physical and chemical laws as if no change whatever had taken place. The body and blood of Christ remain present in these conditions as long as the consecrated species retain the outward appearance and characteristics of bread and wine, but when through deglutition or otherwise these qualities disappear, the Real Presence ceases, and the matter of that substance, which if the process were merely natural, would in the given conditions, have succeeded the bread and wine, is created to meet the exigencies of the new accidents which supervene. Hence the doctrine postulates a real annihilation of matter and a subsequent creation of the same. Besides this, the Real Presence thus explained, involves various other miracles, for instance the multilocation of Christ's body in the Sacrament, and its presence in the consecrated particle without the ordinary relations to space — a presence analogous to that of the soul in the body which it animates, but which is not really measured by any corporeal dimensions. In explanation of this the theologians say that Christ's body in the Sacrament retains its internal, intrinsic dimensions, that is, the mutual relation of the different parts to one another, but is deprived of its extrinsic quantity, that is, its relation to other physical objects and surrounding space. The Council of Trent defined transubstantiation as the traditional teaching of the Church chiefly in opposition to the view put forward by Luther, who, while he retained on Scriptural grounds the doctrine of the Real Presence and defended it against the so-called "Sacramentarians," maintained, however, that the substance of the bread and wine remain after the consecration as before. This theory is called that of "Consubstantiation," a word implying the co-existence in the Sacrament of both the bread and the body of Christ. Another view advanced by some of the early Reformers who rejected the Catholic doctrine, is that of "Impanation," according to which in virtue of the consecration a hypostatical union would be effected between the person of Christ and the bread and wine.

But the specific controversy between the Roman Catholic theologians and the various Protestant sects concerning the *manner* of Christ's presence in the Sacrament has been practically lost sight of, because modern Protestants have for the most part given up the doctrine of the Real Presence altogether, and interpret the words of institution (Matt. xxvi. 26–28, and parallel passages in the Synoptics) and other passages referring to the subject in a figurative sense. Many Catholic theologians maintain that even apart from the authoritative interpretation of the Church, the doctrine of Transubstantiation can be proved from the Scripture texts mentioned. In other words, that the idea conveyed by the word Transubstantiation is as clearly contained in the New Testament as the notion expressed by the words ὁμοούσιος and θεοτόκος, which were the keynotes of the Arian and Nestorian controversies. Others admit that a proof of the doctrine, at least as it is philosophically explained, can be educed from the words of institution only by reading into them subtile considerations foreign to the minds of the Apostles and the New Testament writers. Be that as it may, we find that the early Fathers understand these texts as really implying the doctrine of transubstantiation. They do not, of course, use the word or attempt any philosophical explanation of the mystery, but they affirm that contrary to the testimony of our senses, what seems to be bread is no longer such after the words of consecration, but the body of Christ. Thus Saint Cyril of Jerusalem writes: "What seems bread is not bread, though it seems so to the taste, but Christ's body; what seems wine is not wine, though the taste will have it so, but Christ's blood (Cathech. iv. 9). Similar passages abound in the patristic writings, and that they express equivalently transubstantiation few will deny.

In connection with this doctrine the Council of Trent has defined that in the Eucharist "the whole Christ (body, blood, soul, and divinity) is contained under each species (that is, under the appearances of either the bread or the wine), and also under every part or portion of each species, at least after the parts have been separated (Sess. 13, Can. 3). These two points offer no special difficulty if once the doctrine of Transubstantiation be admitted; it need only be remarked that they exhibit the intrinsic reason why the Catholic Church considers communion under one kind to be sufficient. If priests celebrating mass are obliged to receive under both kinds, it is only because their communion is held to be an integral part of the Eucharistic sacrifice for which both species are absolutely required. For other more subtile questions connected with the theory of Transubstantiation as elaborated by the Roman Catholic theologians, together with the explanations whereby it was made to fit in with the philosophical systems of Descartes and Leibnitz, as well as with more recent theories, consult any of the standard manuals of Catholic theology, for example, that of Wilhelm and Scannell (in English), Vol. II., p. 415 *seqq.* For a criticism of the doctrine from the Protestant point of view, consult Hodge, 'Systematic Theology,' Vol. III., p. 678. *seqq.*

JAMES F. DRISCOLL,
President Saint Joseph's Seminary, Yonkers, N. Y.

Transvaal, Gold Mining in the. The Transvaal, prior to 1903, comprised an area of nearly 120,000 square miles, but in that year, by the transfer of some of the southeastern districts to Natal, this area was reduced to about 112,000 square miles, which nearly equals the size of the Territory of Arizona.

Besides the famous Witwatersrand there are two quartz-mining districts of some importance, namely, Lydenburg and De Kaap.

The Lydenburg district first attracted attention in 1876, when the alluvial deposits of that section began to be exploited. At a later period vein-mining was started, and at the present time several companies are operating in that district. The product in 1898 of five companies, running 137 stamps, was 154,560 tons of ore, yielding 108,884 crude ounces of gold (an average of 14.09 dwt. gold per ton) valued at £314,953.

The De Kaap gold-fields were discovered in 1884. In 1898, seven companies, running 200 stamps, produced 89,760 crude ounces of gold, valued at £296,330.

General Features of the Witwatersrand.— This mining district derives its name from the *Witwatersrand,* or "white-waters range," of hills immediately north of Johannesburg. These hills rise from 400 to 600 feet above the general level of the surrounding country, have a general east and west trend, and constitute the watershed of this part of South Africa, their northern slope draining into the Limpopo River and thence into the Indian Ocean, and their southern slope into the Orange River and thence into the Atlantic. This ridge can be traced about 40 miles, and consists of quartzites and inter-stratified schists.

The gold-field lies on the high plateau of the southern Transvaal. In its physical aspect the country bears a striking resemblance to certain parts of Wyoming and Nevada. While perhaps somewhat less regular in its undulations, it is equally destitute of trees other than a sparse growth of shrubs, and in appearance suggests herding and agriculture rather than mining. It is from 4,200 to 6,000 feet above sea-level, to which fact it owes its temperate and mild, indeed salubrious climate, in spite of its semi-tropical latitude. The coastal lands contiguous to the Transvaal are malarial and unhealthful.

The soil of the country is in most localities fertile; but irrigation is generally necessary; and this, owing to the lack of facilities for storing water, is not feasible at the present time.

The Transvaal has a rainy season of four or five months, the heavy rains commencing usually with November or December and continuing until March or April. This is what is known as the summer or warm season. The thermometer rarely reaches 95 degrees in the shade, and the heat is "dry." During the remaining "winter" months (April to September) rain is very exceptional, and there is no extreme cold. Snow is a rare occurrence in the Witwatersrand district. While the climate is remarkably salubrious and invigorating, the district has had in the past a high rate of mortality, by reason of the lack of proper sanitation. Undoubtedly this will be greatly minimized under better government.

The town of Johannesburg (q.v.) lies upon the southern slope, about midway between the east and west extremities of the "banket"-basin, immediately to the north of what is known as the central section of the Rand. This is by far the most important mining section of the gold-field. The Witwatersrand district, in a comprehensive sense, embraces also the outlying districts of Heidelberg and Klerksdorp. Johannesburg is reached by three railway-lines, from the ports of Cape Town, Delagoa Bay, and Durban, the distance by rail being 1,013, 396, and 487 miles respectively.

Historical.— Mining in the Transvaal was prohibited until 1868, at which time the Boer government, being in dire financial straits, threw open the gold-fields to exploration and exploitation by all comers, and even went so far as to offer a bonus for the discovery of profitable mines in the country. As a result, prospecting in the early '70s led to the discovery of quartz-veins and the inauguration of mining in several parts of the northern Transvaal. In 1885 the conglomerate- or "banket"-beds of the Witwatersrand were discovered. In that year a small stamp-battery was erected to crush the material of a quartz-vein, a few miles west of Johannesburg, and a crushing of conglomerate was subsequently made in this battery. But it was not until April 1887 that a battery of three stamps was erected to treat the ore of the Witwatersrand "banket." This was followed by the erection of other batteries, and the output of gold for that year was 23,000 ounces. The product increased by leaps and bounds, as is shown by the table of production given later.

Mining Titles.— The mining laws of the Transvaal are excellent in character, and while the claims cover every square foot of land for an area of nearly 40 miles long by from two to three miles wide, there have been practically no conflicts over extra-lateral rights.

Notwithstanding the change in the political status of the Transvaal following the war, the main features of the mining law of the South African Republic are retained. The principles of the English common law and the immemorial precedents of English practice uphold present rights according to the statutes in force at the time of their inception. The mine-operators of the Transvaal whose titles were acquired from the Republic are therefore secured in the position thus defined; and hence it is not inappropriate in this place to state the Transvaal mining law as it existed prior to the war.

According to that law, the right of mining for and disposing of all precious metals and precious stones belongs to the state; but the state president, with the advice and consent of the executive council, may, by proclamation, throw open government ground as a public diggings, upon which mining claims can be "pegged off" (that is, located) as specified by law.

An owner of a farm may, upon application to the government, have the farm likewise proclaimed. Before the proclamation of a private farm, the owner has the right of allotting to any person or persons he may specify a certain number of claims, called *Vergunning* claims, the number depending upon the size of the farm, but not exceeding 60 as a maximum.

The owner has the further right to reserve for himself one tenth of the ground, which is called a *Mynpacht.* This portion is held by the owner as a lessee, under what is called a *Mynpacht Brief,* for a term of not less than five years, nor more than 20 years, with the privilege of renewal. The rental on *Mynpacht* is 10*s.* per *Morgen* (2.11 acres).

He may also retain a certain area for residential and farming purposes, called a "*Wer*" or homestead. Finally, the owner of a proclaimed farm is entitled to one half of all licenses paid to the government.

A reef-claim (lode-claim) is 150 Cape feet (155 English feet) on the strike of the reef by 400 Cape feet (413.2 English feet) in the direction of the dip — about 1.47 acres.

TABLE I.— SOUTH AFRICAN LAND-MEASURES.

1 Cape ft.....	= 1.033 English ft.
1 Cape sq. ft....	= 1.067 English sq. ft.
1 Claim	= 150 by 400 Cape ft. = 60,000 Cape sq. ft. or 64,025 English sq. ft. = 1.47 English acres.
1 Morgen	= 92,196 English sq. ft. = 2.1165 English acres of 43,560 sq. ft.

Prospecting is not allowed on private ground without permission of the owner, but public ground is open to prospectors, though claims may not be pegged out until after proclamation of the ground in question as above described.

For a prospecting license on proclaimed private ground there is a charge of 5*s.* per month per claim, half of which goes to the owner and the rest to the government. On government ground the similar charge is 2*s.* 6*d.* per month, which goes to the government.

When, in the judgment of the mining commissioner, the results of the exploration justify the step, he may convert the prospecting licenses into a digger's license, after which a charge of 20*s.* per claim per month is made, provided ore from the property is being crushed. If, however, no ore is being extracted and crushed from the claim, the charge for the digger's license is 15*s.* per month.

In 1896 the receipts from prospecting licenses amounted to £620,000; from diggers' licenses, £61,000, and from machine-stand licenses, £59,000.

Financial Conditions.—At the outbreak of the South African war the total capitalization of the gold mines of the Witwatersrand was over £70,000,000 at par, and at market prices about £147,000,000. A large part of these amounts represents worthless properties which have been "floated" during "boom" times; yet, notwithstanding this excessive capitalization, the mines yielded about 7 per cent on the total capitalization at par, and about 3.5 per cent on market prices. Eliminating properties notoriously without value, and also the capitalization of certain "deep-level" properties which have not, as yet, reached a producing stage, we may pronounce the returns from *bona fide* investment and competent management to have been exceedingly satisfactory.

In 1898 77 companies operating stamp-batteries produced 4,295,609 crude ounces of gold bullion of the value of £15,141,376, and of these companies, 41 distributed in dividends for that year £4,847,505, or about 15.6 per cent on their nominal capital of £31,018,000. The market capitalization of the same companies, however, was £82,555,000; and the dividends returned on this capitalization were about 5.9 per cent.

The majority of the "outcrop companies"— indeed, nearly all of those situated in the central section (extending from the Langlaagte Estate to Knights, on the Witwatersrand)— are free of indebtedness, and will not require further capital, unless for future increase of plant, especially for enlarging their milling capacity. Any additional capital required for such purposes could be provided either from the profits already earned, or by the issue of debentures, to be ultimately likewise redeemed from profits.

For the "deep-level" properties, on the other hand, and especially for those covering the deeper levels, that is, those situated on the second and third lines of claims parallel to the outcrop, a large amount of money must be expended before the mines can become productive. Instead of increasing the capital stock for this purpose, it is generally the practice of the Rand companies to raise the money by the issue of debentures. There has been no difficulty in obtaining working capital by these means, often to the extent of £400,000 or £500,000. About £5,000,000 of such debentures have been issued.

Houses of high standing have been able to raise such loans of working capital upon debentures bearing interest at 5 to 6 per cent per annum, giving as an inducement to the purchaser the right to exchange the debentures for fully paid-up shares, at a certain price, within a given period from the date of issue, during which period the shares are likely to command a good premium.

Nearly all the Rand companies are controlled by large financial concerns, such as Wernher, Beit & Company, who control the Rand Mines group and some other properties; the Cons. Gold Fields Company, which controls the Simmer and Jack (one of the largest mines on the Rand), the Robinson Deep, the Nigel Deep, and some of the first, as well as many of the second, row of "deep-levels"; the Messrs. Farrar, who control the East Rand Proprietary and its subsidiaries, the Angelo, Dreifontein, New Comet, etc.; Barnato Brothers, who control the Primrose, Glencairn, Ginsberg, Roodepoort, etc.; and A. Goerz & Company, who control the Geldenhuis Estate, the May Cons., the Lancaster, and the Geduld Princess Estate, etc.; Mr. Neumann and associates, controlling the Cons. Main Reef, Treasury, and Wolhuter; Messrs. Alba, controlling the Aurora West, Meyer & Charlton, Geo. Goch, Van Ryn, etc.; and J. B. Robinson, who controls the Robinson group, comprising the Langlaagte and Randfontein Estates and their several subsidiaries. These parties have the entire financial and technical direction of the companies in which they possess a major voting interest. All the important companies are listed on the stock exchanges of Johannesburg and London.

The financial administration of the Witwatersrand mines is, as a rule, able and honest. The Transvaal law requires a monthly statement of the amount of ore crushed, gold produced, etc. Such reports are published monthly by the companies in great detail.

As a rule, the Johannesburg local directors and mine managers are exceptionally trustworthy, and full reliance can be had on the accuracy of their reports. Sometimes, however, attempts are made, for market purposes, to underestimate the working costs, by charging to capital expenditure money which should strictly be reckoned as working expenses. In this way fictitious profits may be shown; but the practice is not usual, and latterly has been seldom adopted.

The following tables show (A) the monthly output for 1903; (B) the annual production since 1884.

TABLE A.—TRANSVAAL GOLD PRODUCTION FOR 1903.

1903	Witwatersrand Mines					Outside mines	All Transvaal
	No. of Co.'s	Tons milled	No. of stamps	Fine gold oz.	Value		
January	43	405,904	2,905	192,935	£819,535	£26,954	£846,489
February	44	388,440	2,975	187,978	798,480	36,259	834,739
March	47	437,705	3,120	208,457	885,467	38,272	923,739
April	47	450,490	3,285	218,900	929,830	38,106	967,936
May	47	471,476	3,380	224,410	953,231	41,274	994,505
June	49	496,960	3,523	288,168	969,194	43,128	1,012,322
July	52	523,897	3,725	242,071	1,028,250	40,667	1,068,917
August	55	570,647	4,047	262,570	1,115,325	39,714	1,155,039
September	53	573,316	4,135	267,513	1,136,325	36,886	1,173,211
October	53	598,077	4,275	275,664	1,170,946	37,723	1,208,669
November	..	570,000	.....	272,107	1,155,836	32,735	1,188,571
December	..	591,000	.....	277,800	1,180,000	35,000	1,215,000
Totals	..	6,086,912	.....	2,918,573	£12,142,419	£446,718	£12,589,137

TABLE B.— GOLD PRODUCTION OF THE TRANSVAAL.

Date	Witwatersrand District			Outside mines	All Transvaal
	Tons milled	Value	Value per ton milled		
1884-89	1,000,000	£2,440,000	48.8 *s.*	£238,231	£2,678,231
1890	730,350	1,735,491	47.4	134,154	1,869,645
1891	1,154,144	2,556,328	44.2	367,977	2,924,305
1892	1,979,354	4,297,619	43.4	243,461	4,541,071
1893	2,203,704	5,187,206	47.0	293,292	5,480,498
1894	2,830,885	6,963,100	49.2	704,052	7,667,152
1895	3,456,575	7,840,779	45.2	728,776	8,569,555
1896	4,011,697	7,864,341	39.2	739,480	8,603,821
1897	5,325,355	10,583,616	39.74	1,070,109	11,653,725
1898	7,331,446	15,141,376	41.3	1,099,254	16,240,630
1899 (*a*)	6,639,355	14,046,686	41.15	661,220	15,728,693
1899 (*b*)	233,395	(*c*) 1,020,787	....		
1900	459,018	1,510,131	65.82	.....	1,510,131
1901	412,006	1,014,687	49.25	81,364	1,096,051
1902	3,416,813	7,179,073	42.02	74,592	7,253,665
1903 (*d*)	6,086,912	12,142,419	39.88	446,718	12,589,137

(*a*) January to October.
(*b*) November to December and supplementary.
(*c*) Incomplete.
(*d*) Returns for December are estimated.

In the formation of a new company the owner or owners of the mining claims (and often the financial promoting syndicates) usually receive a certain number of vendors' shares of the company to be formed by an amalgamation of claims. Moreover, a certain number of shares are sold (usually at par) for working capital; and a certain number of shares are retained as a treasury reserve, which frequently are sold, some time afterward, at a considerable advance. The majority of the companies have greatly increased their capital since their formation; but, notwithstanding this fact, their new shares are in many cases several hundred per cent above par.

Dividends.—The total dividends paid up to 1899 by the Witwatersrand Gold Mining companies amounted to £18,859,952. Dividends increased from £811,864 in 1892 to £4,847,505 in 1898.

DIVIDENDS AND EXPENSES PER TON OF ORE MILLED.

Year	Ore Milled Tons	Value per ton of ore	Dividends per ton	Expenses per ton
1892	1,979,354	43*s.* 5*d.*	8*s.* 2*d.*	35*s.* 3*d.*
1893	2,203,704	47 0	9 11	37 1
1894	2,830,885	49 2	10 10	34 9
1895	3,456,575	45 2	12 8	32 8
1896	4,011,697	39 2	8 2	31 0
1897	5,325,355	39 9	10 4	29 5
1898	7,331,446	41 4	13 2	28 1
1899*	6,639,355	41 2	8 11	32 4

* January to October.

In this calculation, to arrive at the working costs, the dividends are deducted from the total yield of all producing mines, and the remainder is considered to be the cost of production. Out of the 79 producing gold mines, in 1899 (two of which closed down in January with a joint production of only 282 ounces of gold), only 36 actually paid dividends. The high cost per ton figured out on the above basis for 1899 is due to the fact that a large amount of the profits actually earned and available for dividends were not distributed, being kept in hand to provide for extraordinary expenses expected by reason of the impending war. Even with this drastic method of calculation, the excellent showing of the mines is most remarkable.

The following (Table C) shows the amounts paid in dividends since 1900. Another table (D) showing a list of dividends declared during 1903 is added on the following page.

TABLE C.— DIVIDEND LIST, RAND GOLD MINING COMPANIES.

Year	Number companies	Amount paid
1900	..	.....
1901	5	£ 415,813
1902	23	2,148,715
1903	31	3,900,000

Economic Conditions.—The methods of mining in the Witwatersrand district present no features specially different from those followed in the exploitation of similar deposits elsewhere. (See GOLD MINING; GOLD STANDARD AND GOLD PRODUCTION.) In 1898 there were employed upon the Rand 9,476 whites and 88,627 Kaffirs. The

white laborers are predominantly British, though the leading consulting and superintending engineers, and many of the important members of the technical staffs, are Americans. The mine- and mill-foremen are usually either Americans or British subjects who have had mining experience in America. These men are generally thoroughly competent; but the average of white labor as a whole, especially among carpenters and machinists, is far below the American standard. Considerable improvement, however, is taking place in this regard. A large part of the manual laborers on the surface, and all the miners except those running machine-drills, are blacks — Basuto, Zulu, Shangani, and Zambesi "boys." The quality of this black (native) labor is very poor. Most of the "boys" are utterly inexperienced when first employed; and they rarely remain long enough to acquire great proficiency. When they arrive, making in many cases tramps of several hundred miles to reach the mines, they are in an emaciated condition, and require to be "fattened up" for several weeks. After a few months' sojourn they become fine specimens physically; and, in some cases, they remain long enough at the mines to become expert miners. But it is exceptional to find great efficiency among the "boys" in drilling holes. They receive average monthly wages of £2 9s. and their board (which amounts to about 12s. per month). Their task is a hole of three feet per day. The holes to be drilled are located by the shift boss, and the holes are fired by him, firing by the "boys" being usually forbidden. Some of them, however, acquire sufficient knowledge to fire a hole, and also to run a machine-drill. The latter work is generally done by contract, and the contracts are given to whites.

TABLE D.— WITWATERSRAND MINES, DIVIDENDS DECLARED IN 1903 (INCOMPLETE).

Name of company	Issued capital	Per cent	Amount
Angelo	275,000	50	£137,500
Bonanza	200,000	100	200,000
Crown Reef	120,000	155	186,000
Crown Deep	300,000	50	150,000
City and Suburban	1,360,000	15	204,000
Durban Roodepoort	125,000	75	93,750
Dreifontein	275,000	40	110,000
Ferreira Deep	910,000	10	91,000
Ferreira	90,000	187½	168,750
Geldenhuis Estate	200,000	60	120,000
Geldenhuis Deep	300,000	45	135,000
Ginsberg	175,000	10	17,500
Henry Nourse	125,000	100	125,000
Jubilee	50,000	25	12,500
Langlaagte Estate	470,000	20	94,000
Lancaster West	195,000	10	19,500
May Consolidated	288,750	32½	93,843
Meyer & Charlton	100,000	40	40,000
New Primrose	325,000	15	48,750
Nigel	223,106	5	11,155
Rietfontein "A"	317,500	10	31,750
Rose Deep	425,000	22½	95,625
Robinson	2,750,000	11	302,500
Robinson Deep	950,000	25	237,500
Roodepoort U. M. R.	295,000	15	44,250
Simmer & Jack	3,000,000	5	150,000
Treasury	540,000	13¾	74,250
Village Main Reef	400,000	20	80,000
Wemmer	80,000	100	80,000
			£3,352,373

This is not complete, as some mines do not declare their dividends until quite late in the year. The total amount for the year is estimated at £3,900,000.

By reason of the rapidly increasing demand for labor and the obstacles interposed by the Boer government, there was a great deficiency of native labor. As a result, large numbers of air-drills have been necessarily employed in stoping, to the great disadvantage of the mines, since much of the ground is of such a character as to make stoping by machine-drills economically unadvisable. Where the reefs are flat or small, the employment of drills necessitates the breaking down of much larger blocks of ground than would be necessary with hand-drills. Moreover, work under such conditions involves the excessive use of dynamite,— an important item where dynamite is as expensive as it has been upon the Rand,— and creates at the same time an undue amount of fine waste, which not only lowers the yield of the ore in the battery, but increases the production of slimes.

The percentage of working costs of mining is given in the subjoined table, from which may be seen that the white and the native labor represent about 30 per cent each.

TABLE SHOWING PERCENTAGE OF WORKING-COSTS.

	Per cent
White labor	31.22
Native labor (including food)	29.83
Explosives (dynamite, fuse, caps)	9.70
Coal	9.07
Chemicals (cyanides, etc)	3.22
Tools, steel, shoes, dies, etc.,	3.29
Mining timbers, lumber	4.05
Candles, lighting	1.38
Sundries	8.24
Total	100.00

The working returns for 1903 are far below the producing capacity of the equipped mines, nearly all of which have some stamps standing idle, owing to the insufficient supply of labor. The position that the industry had reached in October 1903 was equivalent roughly to 72 per cent of the results obtained in August 1899, just before the war.

WITWATERSRAND RETURNS.

	August 1899	October 1903	Ratio per cent
Stamps running	5,970	4,275	71.6
Tons milled	812,469	598,077	73.6
Value of yield	1,642,025	1,170,946	71.3

In July 1903 the number of stamps erected was 7,145, of which 3,725 were running and 3,420 were idle. The earning capacity of the idle stamps, according to H. H. Webb, was £11,000,000, which would have given employment to 5,600 skilled white men, whose wages would have been £2,000,000, and dividends amounting to £3,000,000 would have been earned. These figures show the gravity of the labor problem in the Transvaal. Already before the Boer war the difficulty was so pronounced that Cecil Rhodes, some 10 years ago, appealed to the Transvaal government for permission to import coolies for work in the Rand mines, but was met with a curt refusal on the part of President Kruger. Since the incorporation of the two Boer republics into the British Empire matters have become still worse in this respect. For, whereas in 1897 about 100,000 Kaffirs were working in the mines, it was found impossible in 1903 to secure more than 60,000, and no fewer than 200,000 are urgently needed. All attempts to obtain native labor from other parts of British Africa have failed, owing to the inherent indolence of the black man and to his particular aversion to underground

work. The consequence is that the owners are unable to work their mines to anything approaching their full limit. This is all the more serious when it is borne in mind that throughout the war, and for some time afterward, the Transvaal mines, comprising the most important gold-producing area of the world, were practically at a standstill, causing a scarcity of gold, which still exists, and which is regarded as largely responsible for the financial depression.

Under the terms of the new ordinances, which have become statutory in the former Boer republics, the Chinese are admitted under indenture, with provisions which exclude them from embarking in any mercantile pursuit as trader or shopkeeper, and from carrying on any of the callings coming under the head of skilled labor, such as those of blacksmith, carpenter, engine driver, mechanic, etc. It is also expressly stipulated that those who import unskilled labor from China for a stated term shall at the conclusion thereof undertake the repatriation of the coolies at the end of the contract, under penalties of both fine and imprisonment in the case of neglect to comply with this stipulation.

By reason of the long transportation, but especially of the excessive railway rates from coast ports, mining supplies are excessively high upon the Rand. As an example of the exorbitant charges of the South African railways, I quote from the evidence, given by the late L. I. Seymour in 1897 before the industrial commission of inquiry of the South African Republic, the following charges per ton-mile on the different lines named. The amounts are stated in pence:

On the Cape line, 2.34; the Orange Free State, 2.34; the Natal, 3.04; the Portuguese, 4.07; the Netherlands-Cape, 7.69; the Netherlands-Natal, 5.06; and the Netherlands-Delagoa, 4.27.

The rates for 1899, according to the legal adviser of the Johannesburg Chamber of Mines, were as follows:

COMPARATIVE RATES OF RAILROAD TRANSPORTATION IN OCTOBER 1899.

Via	Per ton mile		
	Normal	Intermediate	Rough Goods
Cape	2.34 d.	1.7 d.	1.6 d.
Orange Free State	2.34	1.7	1.6
Natal	3.24	2.28	2.21
Netherlands — Cape and Orange Free State	7.3	6.15	3.8
Natal	4.74	3.8	2.8

The average local rates for normal goods on the various systems for 150 miles is as follows:

Netherlands Railroad	6d.	per ton-mile
Cape Railroad	4.3d.	per ton-mile
Natal	4d.	per ton-mile

Generally speaking, the principal machinery at any time will be found to cost, erected, two and a half times its home cost.

By reason of a monopoly granted by the Boer government to foreign concessionaries, with whom leading Transvaal officials were privately associated, the cost of dynamite constituted about 9 per cent of the working expenses of the Rand mines.

The cost of coal has amounted to 8 per cent of the working cost. Fortunately for the mines, coal was discovered in South Africa shortly after the discovery of the gold deposits. The principal coal fields are from 15 to 20 miles east of Johannesburg. Coal costs about 8*s.* per ton, delivered at the pit's mouth, and the railway rates are about 3*d.* per ton per mile. The best quality of coal obtainable in the Transvaal has about 70 per cent of the efficiency of Welsh coal; but the average efficiency is lower than this.

The estimated value of the total amount of gold to be mined is $3,500,000,000. It is probable that within 30 years nearly all the payable reefs will have been exhausted, and the Rand, having ceased to be valuable, will be abandoned by most of its inhabitants, obliged to seek elsewhere their means of livelihood.

South Africa as a whole gives no promise of becoming a leading factor in the economic life of the world. Mr. Bryce's forecast of the gold regions outside of the Rand throws light on the whole situation. He says:

«Assuming that a fair proportion of the quartz-reef gold fields turn out well, it may be predicted that population will increase in and around them during the next 10 years, and that for some 20 years more this population will maintain itself, though of course not necessarily in the same spots, because as the reefs first developed become exhausted, the miners will shift to new places. After these 30 or possibly 40 years, that is to say, before the middle of the 20th century, the country, having parted with its gold, will have to fall back on its pasture and its arable land; but, having become settled and developed, it may count on retaining a reasonable measure of prosperity.»

JOHN HAYS HAMMOND,
American Institute of Mining Engineers.

Transvaal (trans-väl') **Colony** (formerly the SOUTH AFRICAN REPUBLIC), a British colony in South Africa, bounded on the north by Matabeleland, on the east by Portuguese East Africa and Swaziland, on the south by Natal and the Orange River Colony, and on the west by Griqualand West, British Bechuanaland, and the Bechuanaland protectorate. The area, previous to 1903, was 119,139 square miles, but was in that year reduced to about 112,000 square miles by the transfer of some of the southeastern districts to Natal. The land consists in the main of a plateau lying between 3,500 and 5,000 feet above the sea. On the east this plateau is bounded by a northern extension of the Drakenberg, rising to an altitude of 8,725 feet. East of this the land falls rapidly toward the coastal regions of the Portuguese territory. Two main cross ranges traverse the interior of the plateau; the Zand River Mountains in the north, and the Witwatersrand in the south. The latter forms the divide between the Vaal River, flowing on the southern, and the Limpopo River on the northern boundary. The geological structure consists of granite and slate covered by the Cape formation of sandstone, slates, and conglomerates, and in some parts by coal-bearing strata. The plateau and mountains are exceedingly rich in minerals, including gold, diamonds, coal, lead, silver, sulphur, cobalt, saltpetre, copper, and iron. The gold deposits are among the foremost in the world. In 1898, the year previous to the war, the annual output had run up to $77,975,000, and had again reached more than two thirds of that amount in 1903. (See

TRANSVAAL, GOLD MINING IN THE.) In 1898 the production of diamonds, found chiefly near Pretoria, amounted to $200,000, and of coal to 1,907,000 tons. The climate in the eastern and northern lowlands is tropical; on the plateau it is cooler and very agreeable, but the rainfall is deficient. Forests, chiefly of acacias, are but of small extent. With irrigation the soil would be well suitable for all European and sub-tropical agricultural products, but up to the present time there has been very little agriculture, the Boers being chiefly occupied in cattle raising. Industries are hindered by the insufficient means of communications (there are about 800 miles of railroad), and especially by the lack of unskilled labor for the mines. The natives are not available, and in 1903 it was decided to permit the importation, under suitable restrictions, of Asiatic coolies. The principal exports are gold, wool, cattle, hides, ostrich feathers, ivory, and minerals. The chief imports are provisions, machinery, and clothing. The government is vested in a governor, lieutenant-governor, and a legislative council. The capital is Pretoria, and the largest city is Johannesburg. The total population was given in 1898 as 1,094,156. Of these 748,759 were natives, Kaffirs, Basutos, and Bechuanas. Only one third of the white population were Boers (q.v.), the rest being, previous to the war, termed "Uitlanders." Transvaal was settled by Boers from Cape Colony in 1833–7. In 1856 they adopted a republican constitution, but internal disagreements, unwise administration, and troubles with the natives forced the republic in 1877 to consent to annexation by Great Britain. In 1880, however, the Boers rose in arms, with the result that their independence was re-established, subject to British control over external affairs. The discovery of gold brought in large numbers of foreigners, chiefly English, who demanded a voice in the government. After fruitless appeals to Pretoria, and a disastrous attempt at insurrection in 1896 (known as the "Jameson Raid"), the Uitlanders appealed to the British government. After three years of negotiations England, in October 1899, rejected an ultimatum addressed to it by the Transvaal government, which thereupon invaded British territory. The war, in which the Orange Free State threw in its lot with the South African Republic, lasted nearly three years. After a series of remarkable initial successes had been gained by the Boers, the two republics were finally occupied by British troops, and their annexation to the British Dominions was proclaimed 1 Sept. 1900, although hostilities continued until June 1902. See SOUTH AFRICAN WAR; TRANSVAAL, GOLD MINING IN THE.

Transvaal War. See SOUTH AFRICAN WAR.

Transylvania, tran-sĭl-vā'nĭ-a (German, *Siebenbürgen;* Hungarian, *Erdély*), Austria-Hungary; the southeast portion of the empire, since 1868 incorporated with Hungary; area, 21,500 square miles. The surface is mountainous, being covered by the Carpathian chain and its ramifications. The whole belongs to the basin of the Danube, which receives a great part of its waters circuitously by the Maros and the Szamos, both tributaries of the Theiss. The climate is healthful; the summer heat of the lower grounds is at times extreme. There are magnificent and valuable forests; fruits abound everywhere, and the culture of the vine is general. The crops include, beside the ordinary cereals, potatoes, etc., also maize, hemp, flax, and tobacco. Fine breeds of horses, cattle, and sheep are reared. Many horses are exported. Large numbers of swine are fattened. The wild animals include bears, wolves, and wild boars. The minerals are important, and include gold, silver, copper, lead, iron, quicksilver, antimony, coal, and salt. The last occupies immense tracts. Manufactures have made little progress, and are chiefly in the hands of Germans. The trade is chiefly confined to the natural produce of the country, and imported manufactures. The chief centres are Hermannstadt, Kronstadt, and Klausenburg. Education is in a somewhat backward state. The population, about 2,500,000, is very mixed. The principal nationalities are Rumanians, Magyars, and Germans, besides Gypsies, Jews, Bulgarians, and others. The chief religious bodies are Roman Catholics, Greek Catholics, and Protestants. The name Transylvania, signifying "beyond the woods," is due to the extensive forests on the western side. In ancient times Transylvania was a part of the province of Dacia. From the 4th century onward it was occupied by various nations in succession. In 1004 it was conquered by Stephen I. of Hungary, and was afterward governed by a viceroy (*voyvode*). In the 16th century the voyvode John Zapolya obtained Transylvania as a sovereign principality, but it could not maintain its independence against the house of Austria, and in 1713 was united to Hungary. In 1765 Maria Theresa raised it to the rank of a grand-principality. It suffered severely during the commotions of 1848–9, and since 1867–8 it has been reunited to Hungary.

Trap, a term employed for fine-grained basic igneous rocks of a dark color and crystalline texture. Most trap rocks are either fine-grained basalts, diabases, diorites, or gabbros. The term is a convenient one when the exact nature of the rock has not yet been determined, and is largely used in field work. The Palisades of the Hudson, North Mountain in Nova Scotia, the Giants' Causeway, and Fingal's Cave are familiar examples. The name is derived from the Swedish "trappar," applied to these rocks from their occurrence in step-like sheets.

Trap-door Spiders, large hairy theraphosid spiders of the family *Ctenitzidæ* and its allies, which inhabit dry warm countries, and form well-like pits or burrows in the ground, closed by a hinged lid. These burrows are placed in high, well-drained situations and are dug by the owners, who cut down and carry away the earth in their jaws, depositing it at some distance. The holes vary in size with the species and age of the occupant, and the largest may be more than a foot deep. The burrow of a species (*Ctenitza californica*) common in southern California, is of that depth, and an inch in calibre, when the owner is fully grown. In some species the wells have a branch burrow slanting from one side, and others make two entrances, so that a plan of the burrow would resemble a Y. These burrows are lined with a coating of silk, and in every case the entrance (or entrances) is closed by a tight-fitting circular door composed of clay, bound and lined with silk, and hinged at one side to the lining of the burrow; the top of the door is left rough and earthy, so that when it is closed nothing betrays the presence

of such a contrivance. In this snug castle the spider dwells in safety and comfort, rearing its young under the protection of the door, which it can hold so firmly shut that nothing short of tearing the structure apart will suffice to open it. In the species of the south of Europe the lining and door are much thinner than those made by the American trap-door spiders; and if these doors are torn off a new one will be made overnight, for several nights in succession or until the insect's strength is so exhausted that it can no longer produce the requisite silk. For further facts consult general works, especially Moggridge, 'Harvesting Ants and Trap-door Spiders' (London 1873). See SPIDERS.

Trap-nets. See POUND-NET FISHING.

Trap-rock. See ROCKS.

Trap-shooting. The history of trap-shooting dates back for many years, but not until recently has the sport assumed anything like a humane aspect. It formerly consisted of a series of traps set in the ground in each of which was imprisoned a live pigeon, and at a given signal of the marksman the operator of the traps liberates one of the birds. The elimination of live pigeons from the traps and the substitution of the "clay pigeon" or "blue rocks" has attracted a large number of excellent "shots," who have heretofore done little or no shooting. The modern and more humane method of trap shooting consists of a spring trap in which a "clay pigeon" or circular disk is fixed. The trap may be set so as to throw the target at any desired angle, thus making the "kill" as difficult as though there were a live bird. We are indebted for the invention principally to A. H. Bogardus, a famous trap-shooter, whose device, although it did not prove wholly successful, led to the development of the modern spring trap.

A late novelty in trap-shooting and one which greatly tests the skill of the marksman is the erection of the shooting towers. They are usually about 50 feet high and the "clay pigeons" are thrown from the top of the tower instead of from the ground. The levers are worked from below and hurl the targets at any desired angle.

Gradually most of the prominent gun clubs are adopting the "clay pigeon" method of trap shooting, so that we may soon look for the time when live birds will no longer be used to satisfy the inhumane cravings of the unsportsmanlike gunners.

JOHN H. BYRNS, JR.,
Vice-President Union Sportsman's Club, Long Island.

Tra'pa. See SINGHARA-NUT.

Trapani, trä'pä-nē, Italy, a seaport and episcopal see in Sicily, 47 miles southwest of Palermo. It is a walled town, and its port the safest on the western coast. The chief edifices are the cathedral, provincial palace, and lyceum. A statue of Victor Emanuel stands in the piazza bearing his name. The manufactures consist of coral, alabaster and shell objects, ice and olive-oil. There is an active trade in wine, salt and flour. The fisheries are important, especially sponges, and tunny-fish. At a short distance northeast of the town is Mount San Giuliano, the ancient Eryx (q.v.). Pop. (1901) 60,257.

Trape'zium, a quadrilateral figure of unequal sides, and consequently unequal angles, but with two of the sides parallel. A *trapezoid* is a quadrilateral figure with no two sides parallel; but sometimes the respective meanings are interchanged.

Trapha'gen, Frank Weiss, American chemist: b. Eaton, Ohio, 20 July 1861. He was graduated from Columbia in 1882, afterward pursued special studies in analytical and applied chemistry, and in 1884 became instructor in chemistry and physics at the Military Academy at Staunton, Va. He was professor of chemistry at the College of Montana in 1887–93 and in the latter year accepted the chair of chemistry at Montana State College, which position, together with that of chemist at the Montana Experiment Station, he still occupies. He has published, in addition to numerous State bulletins: 'A New Departure in Cyanide Treatment' (1899); 'Notes on Alkali Soil in Montana' (1899); 'Labor and Industry' (1900); and other works.

Trap'pists. See CISTERCIANS; ORDERS, RELIGIOUS; RANCÉ, DOMINIQUE ARMAND JEAN LE BOUTHILLIER DE.

Trasimeno, Lago, lä'gō trä-sē-mā'nō. See PERUGIA.

Traskites, the early designation of the Sabbatarian Puritans, an English sect. The title was derived from John Trask, of Somersetshire, who about 1617 became a preacher in London. Trask enjoined upon his followers a fast of three successive days, saying that with the third day's fast they would attain the state of justified saints; enforced the performance of all things according to the law of Scripture; required that Sunday be observed with a strictness equal to that with which the Jews observed the Sabbath; eventually made Saturday the day to be observed thus, this feature becoming distinctive of the sect; and established several ceremonial customs. In 1634 the commission for ecclesiastical causes included "Traskists" among the "separatists, novelists, and sectaries" to be proceeded against by the authorities. Trask was haled before the Star chamber, and put in the pillory. Later, he is said to have recanted, though it is also recorded that before his death he became an Antinomian. The Traskites perhaps also assumed the title Separatists (q.v.). The modern Seventh-Day Baptists (q.v.) represent the Sabbatarian views of the Traskites.

Trass, a trachytic tuff from the Eifel district, which is used on the Rhine for hydraulic cement.

Traubel, trow'bĕl, Horace, American editor and author: b. Camden, N. J., 19 Dec. 1858. While very young and engaged in clerical work he did much writing for newspapers and periodicals, in prose and verse, and has continued his contributions to various publications. In 1890 he established in Philadelphia the 'Conservator,' which he has edited from the first number, and to which he has given a strongly individual character in its free treatment of literature and art, politics and reform, and of religious, ethical, and social questions. He is one of the literary executors of Walt Whitman, with whom in his last years he enjoyed an intimate companionship, and concerning whom he has written much. He was joint editor of

Samuel Johnson's 'Theodore Parker' (1890), and editor of Homer Davenport's 'The Dollar or the Man' (1900), etc. He is also one of the editors of the 'Artsman,' which he helped to establish in 1903. He is secretary of the Walt Whitman Fellowship (international), of which he was one of the principal founders.

Trautwine, trowt'wīn, **John Cresson,** American civil engineer: b. Philadelphia 30 March 1810; d. there 14 Sept. 1883. He entered the office of William Strickland, a leading engineer and architect of Philadelphia, in 1828, and made rapid progress in the profession. He designed and had charge of the construction of the Penn Township Bank, assisted in the construction of the United States Mint and other public buildings, and in 1831 became civil engineer on the Columbia Railroad. He was engaged in railroad engineering until 1842 and in 1844–9 was associate engineer with G. M. Totten in the construction of the Canal del Dique, connecting Magdalena River with the Bay of Cartagena. In 1850 he was again engaged with Totten in making the surveys for the Panama Railroad. He was later occupied in a survey of the harbor of Arecibo, Porto Rico, and in railroad surveying in Pennsylvania. He went to Honduras in 1857 to survey the route for an interoceanic railroad, and in 1858 he examined the harbor of Montreal and planned for that city a system of docks. He retired from active business after 1864, though he continued to act as consulting engineer and expert. He published: 'Method of Calculating the Cubic Contents of Excavations and Embankments' (1851); 'Field Practice of Laying Out Circular Curves for Railroads' (1851); and 'Civil Engineer's Pocket-Book' (1872).

Travancore, trăv-an-kōr', India, a native state in the province of Madras, occupying the extreme southwestern part of the Indian peninsula. Area 6,702 square miles. The soil is well watered, fertile, and well cultivated. Coco and areca-nuts, pepper, and coffee are exported. The state is well administered, and both elementary and higher education provided for. The inhabitants are mostly Hindu, and ruled by a raja. Pop. (1901) 2,952,157.

Traveler's Tree, an arborescent plant (*Ravenala madagascariensis*) belonging to the *Musaceæ*. It has a succulent or woody stem, and broad, shining, banana-like leaves, among the largest in the world. They are in two opposed rows, and in one plane, and form a semicircle above the base like an open fan, with ribs many feet long. The *Ravenala* is a very conspicuous object in Madagascar, its original habitat, and usually grows in clumps. Water from the surface of the leaves is conveyed down the channeled petiole to reservoirs in the excavated basal sheaths, whence the thirsty traveler can obtain a refreshing liquid even in the driest seasons. It is otherwise a very useful plant, since the leaves are serviceable in housebuilding, as thatch, partition, and even in making walls. The hard, external cotex is stripped off, beaten flat and used for flooring. The green leaves do duty also as wrapping-paper, rain-sheds, table-cloths, and dishes, and when folded properly, as spoons or drinking vessels. The large flowers are in a spathe, and are racemose, maturing into woody capsules, enclosing seeds that are edible and have a pulpy and lacerate blue aril yielding an essential oil.

Traveling Libraries, small libraries sent out from some central point to different localities. These are designed to give the benefit of good reading to small communities with an inadequate library, to communities which have no library, to schools, study clubs, etc., needing books in special lines. Traveling libraries are also used in connection with the work of University Extension (q.v.). As early as the beginning of the 18th century, Thomas Bray (q.v.), who was sent as a missionary to Maryland by the bishop of London, made it a condition of his undertaking the work that the bishops should aid in supplying libraries. His plan involved a traveling library system with the free distribution of books among the clergy and laity from a central library in the capital of each province. During his lifetime 39 libraries were established in North America, some of which are still in existence. A system of traveling or "itinerating" libraries was established by private enterprise in East Lothian, Scotland, in 1817; at the first, five libraries of 50 volumes each were moved from village to village, the loan of books was first without charge, later a small fee was charged. A society for promoting "itinerating libraries" was formed at Edinburgh in 1827, and started with five libraries, the number being later increased. The first system of traveling libraries under state supervision and at state expense was organized in Australia. In 1859 the public library at Adelaide sent out eight libraries of 30 books each for interchange among 20 country libraries; the work is now carried on under state supervision in South Australia, Victoria, and New South Wales, with Adelaide, Melbourne, and Sydney as distributing points. The libraries are all of the same general character; libraries on special subjects have not been sent out.

In the United States.— The movement toward the establishing of traveling libraries was begun in New York State in 1892, when Melvil Dewey, the State librarian, obtained a special appropriation for this purpose. A few libraries of 100 volumes each were sent out at first. The New York system has since then been greatly enlarged and perfected under the charge of the Home Education and Traveling Libraries Department of the University of the State of New York. Hundreds of libraries, usually of 25, 50, or 100 volumes, are sent out to schools, literary clubs, small libraries, university extension centres, or any community requesting a library. If there is no library or accredited school or club where these libraries are sent, a guaranty signed by 25 taxpayers is required. A charge of $5 for 100 books is made, and smaller fees for smaller libraries, the State paying transportation. Michigan was the second State, Iowa the third, and Ohio the fourth to make appropriations for traveling libraries; and in 1901, 12 States had made similar appropriations. In most States the libraries are under the charge of the State Library Commission, which also has charge of organizing and improving the general library work of the State, and aiding the establishment of public libraries. But even in States where such commissions are established, no provision is made for traveling libraries, and their establishment has been due largely to private enter-

prise; in Wisconsin, for instance, a traveling library system was begun in Dunn County by Mr. Stout, and by others in Wood County; but is now organized by the State Commission: not only are books and magazines sent out, but a lecturer and organizer often follows the traveling library, to arouse interest in the establishment of a permanent library. In Massachusetts the system of traveling libraries is under the charge of the Women's Education Association; libraries of 25 volumes are sent out to small public libraries in the towns that cannot give adequate support. Another association in Massachusetts supplies study clubs. In other States women's clubs have been the leaders in the organization of traveling libraries; in Kentucky, Tennessee, and Alabama they send libraries to the mountain districts, and in Utah, California, and other western States to miners' and lumbermen's camps, and other isolated districts. Their work has been most successful, and has proved a valuable aid in the uplifting of the life of these communities where educational facilities are almost entirely lacking. A number of railroads have also established traveling libraries, usually for the benefit of their employees only; the Boston & Albany was the pioneer in this direction in 1869, thus preceding the general movement. The Baltimore & Ohio, the Southern Pacific, and the Seaboard Air Line have more recently established traveling libraries; the last mentioned has opened the privileges of the libraries to all people along the road, the libraries being under the charge of the station agents.

Methods.— The success of the traveling libraries depends largely on the care in the selection of books, those who are best acquainted with the work claim that while people who are fond of books will read anything rather than not read at all, the very best must be offered to attract those who are not accustomed to the use of books. The libraries are usually selected at the various centres by trained librarians who have a good general knowledge of the communities to be served. The libraries are mainly of two kinds: (1) the general library for general reading and education, containing books on history, biography and travel, with some novels, or juvenile stories; books on nature study and scientific subjects are also sometimes included; (2) special libraries, consisting of books on some one subject or line of subjects usually sent out to study clubs or schools. The number of books in the first class usually varies from 35 to 50, in the second class from 15 to 30. Where the traveling libraries are under State control, the State usually has a special collection of books for the work which may be supplemented from the State library (as in New York); in Ohio, however, the libraries are always made up from the general State library. The libraries sent out are put in charge of some one person, perhaps the principal of the school, the town librarian, the leader of a club, or some one designated by the citizens; and this person has charge of loaning the books and seeing that they are well cared for; the books are usually kept in some public place, the school, post-office, or a store, or in some home where the citizens feel free to come. A simple charging system for recording the books loaned is sent with the books in New York, and in a number of other States New York laws provide that even where a library is loaned to a club or other organization it shall be free to all citizens. The books in New York State are sent in strong cases, and library book-cases are also provided; in Wisconsin the packing case is arranged for both sending and shelving; in many other States, no arrangement for shelving is made, that being left to the community to which the library is sent. The influence of the traveling library is not confined to the benefit or pleasure derived from the reading of the books in any one library; it serves to awaken a desire for reading, to teach the value and the need of books, and to represent to the community the modern library spirit, and thus often precedes the permanent public library.

Traveling Sidewalks, a transportation system consisting of movable platforms to carry passengers from one point to another. They were first practically tested at the World's Columbian Exposition in Chicago in 1893, and since then successfully installed in Berlin. The sidewalk built for the Paris Exposition in 1900 was over three miles long, and consisted of three parallel platforms, the outer one being stationary, the next having a speed of 4 kilometres, and the inner one a speed of 8 kilometres, per hour. With these speeds it was found to be very easy to step from one to the other at any point. A modification of this plan is the traveling stairway or escalator (q.v.) installed with great success in some of the elevated stations, and large department stores in New York, Chicago, and other cities.

Traverse City, Mich., city, county-seat of Grand Traverse County; on Grand Traverse Bay, an arm of Lake Michigan, on the Pere Marquette, the Grand Rapids & I., and the Manistee R.R.'s, about 145 miles north of Grand Rapids and about 60 miles northeast of Manistee.

Industries, Etc.— Traverse City is an agricultural and fruit-growing region. The excellent harbor gives the city shipping advantages to all the lake ports. The city is also extensively engaged in manufacturing and is especially known for its production of oval wood dishes and corn starch. Other manufactures are flooring, fruit baskets, sash and doors, interior finishings, wagons and sleighs, farm implements, flour, leather, lumber and foundry and machine-shop products. The city has three banks with a combined capital of $310,000.

Institutions, Churches, Etc.— The Northern Michigan Insane Asylum is located here. The city has a high school and five ward schools, municipal buildings, a public library, and churches of all denominations.

History and Government.— Traverse City was first settled in 1852 and became a city in 1896. It is governed by a mayor and a council of 10 elected every two years. Pop. (1904) 10,000.

J. W. HANNEN,
Editor 'Evening Record.'

Trav'ertine, calcareous sinter or chemically precipitated calcic carbonate, generally from streams or lakes, the waters of which contain an excessive amount of lime in solution. It either encrusts vegetable or inorganic matter, or forms a loose more or less porous or spongy mass on the surface of ledges. It is sometimes used for building stone, Saint Peter's at Rome being constructed of it. See CALC; SINTER.

Trav'is, William Barrett, American soldier: b. Conecuh County, Ala., 1811; d. near San Antonio, Texas, 6 March 1836. He was admitted to the bar in 1830, practised law at Claiborne, Ala., and in 1832 removed to Texas, where he soon after took up arms in the struggle for Texan independence. The old mission station of San Antonio de Valerio had been converted into a fort named the Alamo (q.v.) and Travis was in command of it with a garrison of 140 men, when, on 23 Feb. 1836, Santa Anna attacked him with a force of 4,000 Mexicans. The garrison defended the fort without the loss of a man for 10 days, though the only reinforcement which reached them was one of 32 men. A breach was finally made in the wall and in the desperate hand-to-hand struggle which ensued the entire force of Texans, with the exception of Travis and four of his men, were killed. The survivors were taken prisoners and were put to death by order of Santa Anna. The incident forms one of the most thrilling stories in American history, and the object of Travis, to engage the Mexicans for a sufficient period to enable General Houston to organize his army, was accomplished when six weeks later the Texans met and overwhelmed Santa Anna at San Jacinto, rallying with the war-cry "Remember the Alamo!" Consult Amelia Barr, 'Remember the Alamo.'

Trawl'ing, an European mode of fishing in which a net in the form of a large bag 70 to 100 feet long, narrowing to the closed end, is dragged along the bottom of the sea. The mouth or wide end of the net in the "beam trawl" is kept open by a beam, at the ends of which are attached the ends of the rope by which the net is dragged along. In the "otter trawl," which has largely superseded the beam trawl, there is no beam, and the mouth is kept open chiefly by two boards that rest edgewise on the bottom, and are spread out diagonally by wire ropes attached to them and connected with the trawling vessel. In the narrow closed end of the net the fish are collected, and lest they should escape there is usually an inside net opening backward. This mode of fishing is practised to a very great extent in the seas round the British Islands, especially in the North Sea, for nearly all kinds of fish except herring and mackerel. Cod, whiting, and other whitefish are taken in this way in large numbers, and some kinds of flat-fish, as soles, can scarcely be taken in any other manner. There are now many small steam-vessels engaged in this industry, which has largely developed in recent years. It is often objected to as destroying fish spawn, and ultimately tending to injure the productiveness of the fishing-grounds, but except, perhaps, as regards certain localities, this does not seem to be conclusively proved. Latterly, however, it has been prohibited within three miles of the British shores. Trawling is not practised in the American fisheries.

Treacle. See SUGAR.

Treadmill, an instrument of punishment consisting of a large wheel, about 20 or 25 feet wide, with steps on its external surface, upon which the criminals are placed. Their weight sets the wheel in motion, and they maintain themselves in an upright posture by means of a horizontal bar fixed above them, of which they keep hold. The power thus obtained may be applied to the same purpose as water power, steam, etc. The treadmill is the invention of Sir William Cubit and was introduced into the prisons of Great Britain about 1820.

Treadwell, trĕd'wĕl, **Daniel,** American inventor: b. Ipswich, Mass., 1791; d. Cambridge, Mass., 27 Feb. 1872. His inventions include a machine for making wood screws, a power printing-press, a system of turnouts for single-track railroads, and a machine for spinning hemp for cordage. As a consequence of this invention large works were erected in Boston in 1831, and several years later he furnished his machines to the Charlestown Navy Yard. He filled a contract with the government for 12 six-pounder cannon made of wrought iron and steel by an improved method of his devising. This invention was secured by patent in the United States and England, and anticipated by at least 18 years the Armstrong gun formed upon the same plan with additional features. In 1822 he established and conducted in connection with John Ware, the 'Boston Journal of Philosophy and the Arts,' and during 1834–45 he was Rumford professor at Harvard.

Treason is a crime which is directly committed against the supreme authority of the state and is considered the greatest crime that can be committed; it can be committed only by a subject of the sovereign power or a citizen of a state to which he owes allegiance and only against such sovereign or state; it consists essentially in renouncing allegiance and putting one's self in the attitude of an enemy. Under the laws of the United States, treason consists in a citizen levying war against the country or adhering to its enemies; one may be indicted for treason and it is necessary that in such indictment an overt act be alleged; such charge must be proven.

Treasure Island, a tale by Robert Louis Stevenson (1883) introducing one of his most successful characters, John Silver. By this book Stevenson achieved an immediate and wide popularity.

Treasure Trove, in English law, a name given any coin, gold or silver plate, or bullion found hidden in the earth or other private place. In Great Britain such treasure belongs to the crown, and any person finding it is bound to give information of the fact to the officers of the crown. Failing to do so he is liable to fine or imprisonment. The crown, on having treasure trove delivered up to it, is in the habit of paying to the finder its full value, in order that persons may not be induced to conceal such discoveries with a view to the profit, whereby many interesting remains of antiquity might be lost. The term is not often used in the United States, and has not any technical legal meaning.

Treasurer, Lord High, the title given in England to a great officer of the crown first appointed by William I. He was entrusted with the management of the king's exchequer. In 1612 the duties of the office were for the first time distributed among commissioners, and since 1715 this has been the regular practice. After the union of England with Scotland in 1707 the lord high-treasurer of England became lord high-treasurer of Great Britain, and the corresponding office in Scotland ceased to exist.

In 1816, although the title of lord high-treasurer was no longer in actual use, it was enacted that the title and the duties connected with it should thenceforth be held as for the United Kingdom.

Treasury Department, one of the divisions of the United States government, having charge and control of the public revenues and disbursements. The department occupies one of the largest government buildings in Washington. The head of the department is the secretary of the treasury, who is a member of the President's cabinet. There are three assistant secretaries, two comptrollers of the treasury, six auditors, the United States treasurer, the register of the treasury, a commissioner of internal revenue, one deputy commissioner of internal revenue, a commissioner of customs, a comptroller of currency, a deputy comptroller of currency, and a director of the mint. The department also controls the Bureau of Engraving and Printing, the Bureau of Statistics, and the Revenue Marine. See also BANKS AND BANKING; FINANCE; MONEY, and for a list of the successive secretaries of the treasury see UNITED STATES, CABINET OFFICERS, etc.

Treat, trēt, **Mary Lea Adelia Davis Allen,** American naturalist: b. Tompkins County, N. Y., September 1835. She was married to Joseph Treat in 1863, and has published: 'Chapters on Ants' (1879); 'Home Studies in Nature' (1885); 'My Garden Pets' (1887); etc. She is also joint author of 'Through a Microscope.'

Treat, Robert, American soldier and statesman: b. Pitminster, near Taunton, Somerset, England, 1622; d. Milford, Conn., 12 July 1710. He came to Massachusetts in 1635, removed to Wethersfield, Conn., in 1637, settled at Milford in 1649, was assistant to the governor in 1657–65, represented Milford in the general assembly of New Haven colony in 1653–9, and from 1659 to 1664 was, with a year's exception, a member of the governor's council. Repeatedly elected magistrate of Milford, he was ordered at the Restoration to apprehend Whalley and Goffe, the regicides, who were secreted there; but he appears to have postponed issuing a writ of search until they were beyond his jurisdiction. He was again made a deputy in 1663, but in 1666 went with a company of planters to found Newark, N. J. (q.v.), where he remained until about 1671, when he returned to Connecticut, becoming in 1673 a member of its council of war. In 1675, with the rank of major, he commanded the Connecticut force which defeated the Indian besiegers of Springfield and Hadley, Mass.; and in November of that year was appointed second in command to Governor Winslow in the New England forces in the field (see COLONIAL WARS IN AMERICA, *King Philip's War*). For his services he was made deputy-governor of Connecticut in 1676. In 1683, upon the death of Governor Leete (q.v.) he became governor. New York was now anxious to obtain the annexation of Connecticut, and when three royal writs of *quo warranto* were received in 1686, calling upon Connecticut to show title for its exercise of political powers or to abandon them, Governor Dongan made a strong effort to have the colony placed under the jurisdiction of New York. In December 1686 Andros (q.v.) landed at Boston, with commission as royal governor of all New England, and he quickly set about attempting to abrogate the Connecticut charter. The General Assembly met in October 1687, and Andros appeared with about 60 regular troops to enforce his demand. He did not get the charter; why, the records prudently omitted to explain. Tradition has an account (see CHARTER OAK), for the impeachment of which Johnston fails to discover good grounds. Treat then yielded to superior force, and Andros' commission having been read, was made a member of the Council for New England. After the deposition of Andros in 1689, Treat resumed his duties, and continued in office until 1698, when he refused re-election. For ten years more, however, he was deputy-governor. Trumbull describes him as an excellent military officer, and in his governorship as possessed of the caution then so necessary in the difficult affairs of the colony. Consult Johnston, 'Connecticut' ('American Commonwealths' series, 1887).

Treaties, formal compacts or agreements entered into between the governments or rulers of two or more independent states for the purpose of securing mutual advantages or defining mutual duties and obligations. In some respects treaties correspond to ordinary contracts in private law, the main differences relating to the method of conclusion, the nature of the parties thereto, and the remedies for enforcement in case of violation. The right of a state to enter into treaty relations with other states is one of the highest and surest signs of its sovereignty, and one of the common methods by which one nation recognizes the independence of a revolted colony is to conclude a treaty with it. The treaty-making power in monarchical states is usually vested in the crown, but frequently the approval of the legislative body is required, particularly when an appropriation of money is necessary for the execution of the treaty. In countries having the Federal system of government the treaty-making power is usually vested in the central government to the exclusion of the component states. In the United States it is vested in the President, by and with the advice and consent of the Senate, two thirds of the members present concurring, and the States are expressly forbidden to enter into treaty relations with foreign countries or to make agreements among themselves without the consent of Congress. The President negotiates treaties through the Department of State, through the regular ministers abroad, or through special envoys appointed for the purpose. Rarely has the "advice" of the Senate been requested and the constitutional provision requiring it has come to mean "consent" only. In other words, the President negotiates and the Senate ratifies. The participation of the House of Representatives is necessary where legislation is required to carry the treaty into effect. This is particularly true in the case of treaties requiring appropriations of money and in the case of commercial reciprocity treaties. In France where the proposed treaty affects the commercial relations of the republic or involves an appropriation of money, the approval of both chambers of the legislature is necessary. In Germany the approval of parliament is necessary only when the proposed treaty undertakes to regulate a subject

embraced in the category of legislative powers. In Great Britain the crown constitutes both the negotiating and ratifying authority, the approval of neither house of Parliament being required.

The usual conditions mentioned by the authorities as being essential to the validity of a treaty are: (1) The contracting parties must have capacity for entering into treaty relations, that is, they must be sovereign and independent nations, and not dependencies, protectorates or component members of federal states; (2) the negotiating agents must be properly authorized, evidence of which is the possession of an instrument known as a "full power"; (3) freedom of consent upon the part of the negotiating powers. That is, there must be no duress, intimidation, or false representation upon the part of either party. But this requirement does not apply in full force in the case of treaties of peace where from the nature of the case one of the parties is under more or less duress nor does it apply to cases where misrepresentation results from ignorance of the subject in controversy, as for example, imperfect geographical knowledge in a boundary dispute; (4) treaties which stipulate for the execution of objects which are physically impossible, which are repugnant to the usages of international law, or which involve the repudiation of obligations to a third power are invalid. Treaties may be classified according to their duration, form, or purpose. So far as duration is concerned they may be classified: (*a*) as transitory agreements or conventions which expire when the object stipulated for has been performed, and (*b*) permanent or executory treaties whose effect continues indefinitely or for a specified time, such as treaties of friendship, naturalization, extradition, etc. According to their object, international agreements may be classified as treaties of alliance, which may be again subdivided into treaties of defensive and offensive alliance or equal and unequal treaties; treaties of guaranty or such as contemplate the establishment or maintenance of a certain state of affairs, as for example, the maintenance of the neutrality of a state or of a ship canal, or the political existence of a state; and reciprocity treaties providing for the granting of reciprocal concessions usually of a commercial nature. Cartels, or agreements for the exchange of prisoners of war; capitulations for the surrender of an army, fleet, or fortified place; and truces providing for the temporary suspension of hostilities are sometimes classified as treaties, but improperly so. Treaties, like contracts at private law, frequently require interpretation, and a definite body of rules for that purpose has grown up. The most important are the following: The language of a treaty must be given its usual and natural meaning; technical terms are to be given the meaning applied to them in the particular art to which they refer; where a treaty is executed in several languages the sense of the treaty is to be drawn from them collectively; provisions inserted for the special benefit of one party must be strictly construed; favorable clauses are to be interpreted liberally; an interpretation which would render a treaty inoperative is to be rejected; in ascertaining the meaning of a provision the treaty must be regarded as a whole, every part being considered in connection with every other part; etc. The language employed in the preparation of treaties was Latin until the beginning of the 18th century, when it was replaced by French, which is now the general diplomatic language of Europe. Where two negotiating powers have a common tongue, that will naturally be employed; but where they have a different language it is usual to prepare a copy for each state in its own language and arranged in parallel columns.

Treaties are terminated in various ways. They may be abrogated by the mutual agreement of both parties, as was done by Great Britain and the United States in the case of the Clayton-Bulwer Treaty of 1850; or they may cease to be binding when, on account of physical or other changes, it becomes impossible to continue to execute them, as in the case of a treaty granting the right of navigation on a river which is no longer navigable; or where one of the parties refuses to observe the treaty and the other denounces it in consequence of such non-observance; or where all the obligations have been executed; or where one of the parties having an option to do so abrogates the treaty by giving the other the required notice; and finally certain treaties are terminated by the outbreak of war between the parties. Most treaties, however, are only suspended during the existence of hostilities; others, like treaties of commerce and navigation, are usually extinguished.

To insure the execution of treaties hostages were formerly required, but since the middle of the 18th century that practice has not been resorted to. At the present time the fulfilment of treaty obligations rests entirely on the good faith of the contracting parties and the only tribunal to which an injured party may appeal is that of war. See UNITED STATES, *Treaties*.

Bibliography.— Butler, 'Treaty Making Power' (2 vols. New York 1902). For a collection of treaties in English, see Hertslet, 'Treaties.' See also his 'Map of Europe by Treaty'; also Marten, 'Receuil des Principaux Traités'; etc.

JAMES W. GARNER,
Professor of Political Science, University of Illinois.

Treaties, Indian. In a limited sense the Indian tribes of North America have always been treated by the government to which they were subject as foreign nations. Before the Revolution the king maintained diplomatic intercourse with those tribes residing within the limits of the territory claimed by Great Britain, and after the colonies became independent the relations between them and the Indians continued to be regulated through formal treaties, negotiated with their chiefs and approved by the tribe. The articles of Confederation made provision for maintaining diplomatic intercourse with the Indian tribes by vesting in Congress the power to negotiate treaties with them. By the Federal Constitution the treaty-making power was vested in the President, and from the foundation of the government until a recent day the relations between the United States and the several Indian tribes occupying the territory embraced within the limits of the Union were regulated exclusively through regular diplomatic channels. These treaties were negotiated by commissioners or agents with the chiefs on terms of theoretical equality, and were ratified by the Senate according to the usual methods. Considering the actual dependent status of the Indians there was an element of absurdity in the practice of regulating the relations between

them and the government to which they were subject, through diplomatic channels. Besides, this method proved inconvenient and at times embarrassing to the government. Finally by an act of Congress passed in 1871 it was declared that thereafter Indian affairs should be regulated directly by Congress and not by treaty. Since 1871, therefore, no treaties have been concluded with Indian tribes, but those existing at the time of the act were continued in force. The majority of the treaties between the United States and the various Indian tribes have been treaties of friendship or of cession, those of the latter class providing for the extinction of the "possessory right" of the Indians to the lands which they occupied and in some cases for the removal of the Indians to the Territory especially set apart for their use west of the Mississippi River. Among the more important and best known Indian treaties were those of Fort Stanwix of 1784 with the Iroquois, providing for the cession to the United States of western lands claimed by them; the treaty of Greenville of 1795 with the Wyandots, Delawares, Shawnees, Ottawas, Chippewas, Pottawattomies, Miamis, Eel Rivers, Weas, Kickapoos, Piankeshaws, and Kaskaskias by which a large part of the territory embraced in the present State of Ohio was ceded to the United States; the treaty of 1826 with the Creeks for the cession of lands in Alabama and Georgia; various treaties between 1791 and 1835 with the Cherokees for the cession of lands occupied by them in Georgia; the Treaty of Dancing Rabbit Creek of 1830 with the Choctaws for the cession of lands in Mississippi, and the treaty of Pontotoc Creek of 1832 with the Chickasaws for the relinquishment of their claims to lands in the same State. Between 1828 and 1832 treaties were made with the so-called five civilized tribes, the Creeks, Cherokees, Choctaws, Seminoles and Chickasaws, as well as several other tribes of lesser importance, providing for their removal to the Indian territory west of the Mississippi. These treaties usually contained provisions for the payment of a lump sum to each tribe in consideration of the relinquishment of its lands, for the payment of annuities to the chiefs, and the promise of various articles such as rifles, hoes, kettles, blankets and tobacco to each Indian who emigrated. Provision was also generally made for means of transportation to the Indian Territory and for supplying them with wagon-makers, wheelwrights, blacksmiths, millwrights etc. Heads of families desiring to remain and become citizens were usually allowed to do so and were given 160 acres of land.

Down to 1837, at which time most of the Indians formerly residing east of the Mississippi River had emigrated to the Indian Territory, the government had concluded 349 treaties with 54 Indian tribes distributed as follows:

With the Appalachicolas	2
With the Caddoes	1
With the Omahas	2
With the Cherokees	18
With the Chickasaws	8
With the Chippewas	21
With the Choctaws	11
With the Comanches	1
With the Creeks	12
With the Crows	1
With the Delawares	16
With the Eel Rivers	7
With the Floridas	1
With the Foxes	10
With the Hunkpapas	1
With the Illinois	1
With the Ioways	5
With the Kanzas	3
With the Kaskaskias	6
With the Kickapoos	11
With the Mahas	2
With the Mandans	1
With the Menomonees or Menominies	6
With the Miamis	10
With the Minnetarees, or Belantse-Etas	1
With the Missouris	4
With the Mohawks	1
With the Muscogees	2
With the Omahas	2
With the Oneidas	1
With the Osages, Great and Little	7
With the Ottawas	19
With the Ottoes	5
With the Pawnees	6
With the Peorias	2
With the Piankeshaws	8
With the Poncarars	1
With the Poncars	1
With the Pottawattomis	38
With the Quapaws	4
With the Ricaras	1
With the Sacs	12
With the Seminoles	2
With the Senecas	12
With the Seven Nations of Canada	1
With the Shawnees	14
With the Siounes	1
With the Sioux	10
With the Six Nations of New York	4
With the Tetons	2
With the Weas	8
With the Winnebagoes	6
With the Wyandots	14
With the Yanctons	3

For the full text of these treaties with the date of the conclusion and ratification of each, together with the names of the commissioners and signatories see 'Treaties Between the United States and the Several Indian Tribes from 1778 to 1837' (Washington 1837); see also Weil, 'Legal Status of the Indian.'

JAMES W. GARNER,
University of Illinois.

Treaties of the United States with Foreign Nations. The United States has always been a treaty-making country, as well as — and this is more to the purpose — a treaty-keeping country. From the earliest days in its history as a nation, when as a new republic, flushed with victory and hopeful for the future, it appealed to the great foreign powers for recognition, the policy of almost every Congress has been to enter into such agreements, and there has been scarcely a secretary of state who has not realized the necessity of devoting his greatest energies to engendering such sentiments of mutual confidence and friendliness between the United States and some other government. Among the agreements thus established have been the reciprocity treaties which have been such a bone of contention among American statesmen for more than a century. Thomas Jefferson, while secretary of state during Washington's first administration, urged upon Congress the adoption of such a reciprocity policy in regulating the customs and commerce of the United States with other nations:

> "As to the commerce," he said, "two methods occur: First, by friendly arrangements with the several nations with whom these restrictions exist, or, second, by the separate act of our own legislature for countervailing their effect. There can be no doubt that, of the two, the friendly arrangement is the most eligible."

From the days of Jefferson to those of McKinley is a period which represents, practically, the entire history of the United States, but during this time there have been few occasions when

this sentiment has not been supported by some of the greatest men in the American political world, and the success of the reciprocity movement, so far as this country at least is concerned, undoubtedly inspired the last remarks of President McKinley. A few minutes before he was murdered by the assassin he declared:

> Reciprocity treaties are in harmony with the spirit of the time. If some of our tariffs are no longer needed for revenue, or to encourage and protect our industries at home, why should they not be employed to extend and promote our markets abroad.

In all its work of treaty-making, the United States has shown that it is possible for a nation to keep its plighted faith with other powers. It is true that this has not been the history of international agreements, but while other nations have made treaties solemnly, to break them upon the slightest provocation, even a casual study of the history of the treaties adopted by this country will be sufficient to establish the fact that the American agreements were not made to be broken. Treaties that have been made have been abrogated, of course, but, in almost every instance their termination has been occasioned by the notice or request of the foreign power. In 1904 there were but six countries, among the many nations of the world, with which the United States had no treaty. They were Abyssinia, Bulgaria, the Dominican Republic, Monaco, Montenegro, and Uruguay. At the same time the countries with whom no treaties of "peace, amity, and commerce" were established were Brazil, Chile, Egypt, Guatemala, Peru, Rumania, and Salvador. In some cases such treaties had previously existed, but had lapsed, or been terminated upon notice, and as almost all these nations were bound to the United States by other agreements and conventions, such as those relating to the consular office, to naturalization, or to extradition the absence of the formal "amity" treaty in no sense implied a lack of friendliness between the United States and other governments. Among the most important treaties to which the United States has been a party are the various international agreements which have been executed at Geneva, at Brussels, and, since the establishment of the permanent International Court of Arbitration, at The Hague, and the fact that this country is fully in sympathy with the purpose of the court is shown by its anxiety to avoid armed conflict, and the readiness with which it has resorted to the more peaceful methods of arbitration offered by this international tribunal.

The following is a list of the important international acts and conventions in which the United States has been an active participant:

INTERNATIONAL AGREEMENTS TO WHICH THE UNITED STATES IS A PARTY.

Subject	Concluded	Proclaimed by United States
Amelioration of the condition of the wounded in time of war	22 Aug. 1864	22 July 1882
Establishment of an International Bureau of Weights and Measures	20 May 1875	27 Sept. 1878
For international protection of industrial property	20 May 1883	11 June 1887
For international protection of industrial property (supplementary convention)	15 April 1891	22 June 1892
For the protection of submarine cables	14 March 1884	22 May 1885
For international exchange of official documents, scientific and literary productions	15 March 1886	15 Jan. 1889
General act for the repression of African slave trade	2 July 1890	2 April 1892
Formation of an international union for the publication of customs tariffs	5 July 1890	17 Dec. 1890
Regulating the importation of spirituous liquors into certain regions of Africa	8 June 1899	6 Feb. 1901
Relative to the pacific settlement of international disputes	29 July 1899	1 Nov. 1901
Relative to the laws and customs of war on land	29 July 1899	11 April 1902
Relative to the launching of projectiles and explosives from balloons, etc	29 July 1899	1 Nov. 1901
For the adaptation to maritime warfare of the principles of the Geneva convention	29 July 1899	1 Nov. 1901
Additional act for the protection of industrial property	14 Dec. 1900	25 Aug. 1902

Extradition Treaties.—In 1904 the United States possessed treaties of extradition with less than 30 nations, the countries with whom no treaty existed being Bulgaria, China, Costa Rica, Cuba, Dominican Republic, Egypt, Greece, Honduras, Korea, Morocco, Paraguay, Persia, Portugal, Rumania, Siam, Spain, Uruguay, and Venezuela. Such a treaty had existed with Spain, but was expressly abrogated and annulled by Article XXIX. of the Treaty of Friendship and General Relations of 3 July 1902. The crimes and offenses which are extraditable under the treaties in force at that time were generally interpreted as follows: Murder, homicide (comprehending assassination, parricide, poisoning, infanticide, manslaughter, when voluntary), or the attempts to commit any of these crimes. Abduction, kidnapping, or child-stealing. Bigamy. Crimes against railroads, wrongful or wilful destruction or obstruction of railroads which endanger human life. Arson. Crimes committed at sea: (a) Piracy by the law of nations; (b) Revolt, or conspiracy to revolt, by two or more persons on board a ship on the high seas against the authorities of the ship; (c) Wrongfully sinking or destroying a ship at sea, or attempting to do so; (d) Assaults on board a ship at sea with intent to do serious bodily harm. Rape, offenses against chastity committed with violence. Abortion, or procuring abortion. Obtaining money or valuable goods under false pretenses (usually an amount in excess of $200). Forgery, the utterance of forged papers; forgery or falsification of official acts of government, of public authorities, or of courts of justice, of public or private instruments; the use or utterance of the thing forged or falsified. Counterfeiting of govern-

ment acts, of counterfeit seals, stamps, dies, and marks of state, or public administration, or the fraudulent use of any of the above mentioned objects. Counterfeiting or altering money, whether coin or paper, the counterfeiting of titles or coupons of public debt, bank-notes, or other instruments of public credit, and the utterance, circulation, or fraudulent use of same. The introduction of instruments for the fabrication of counterfeit coin or bank-notes or other paper current as money. Embezzlement of public moneys committed within the jurisdiction of either party by public officers or depositaries. Embezzlement by any person or persons hired or salaried to the detriment of their employers. Larceny (usually an amount not less than $200). Burglary, defined to be the act of breaking and entering the house of another in the night time, with intent to commit a felony therein. Robbery, defined to be the felonious and forcible taking from the person of another of goods or money, by violence or by putting the person in fear. Theft of horses, cattle or live stock (of the value of at least $25). Fraud or breach of trust by a bailee, banker, agent, factor, trustee, or other person acting in a fiduciary capacity, or director or member or officer of any company, when such act is made criminal by the laws of both countries (usually not less than $200). Obtaining by threat of injury, or by false devices, money, valuables, or other personal property (usually not less than $200). Receiving moneys, valuables or other personal property with the knowledge that they have been stolen (usually not less than $200). Perjury or subornation of perjury. Crimes and offenses against the laws of both countries for the suppression of slavery and slave-trading. Mayhem and any other wilful mutilation causing disability or death. Bribery.

The following is a list of the extraditable crimes of the various countries, according to the treaties existing in 1904:

Murder, or attempts.— Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Germany, Great Britain, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Abduction, kidnapping, etc.—Argentine Republic, Belgium (of minors only), Bolivia, Brazil, Chile, Denmark, Great Britain, Guatemala, Mexico, Netherlands, Norway, Peru, Servia, Sweden, Switzerland.

Bigamy.— Belgium, Brazil, Guatemala, Mexico, Netherlands, Peru, Switzerland.

Acts endangering safety of persons traveling by railways.— Argentine Republic, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Guatemala, Mexico, Netherlands, Norway, Peru, Russia, Servia, Switzerland.

Arson.— Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Germany, Great Britain, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Crimes committed at sea.—Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, Germany, Great Britain, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Rape.— Argentine Republic, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Great Britain, Guatemala, Haiti, Italy, Japan, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Abortion.— Belgium, Brazil, Denmark, Netherlands, Russia, and Switzerland.

Obtaining goods under false pretenses.— Belgium, Guatemala, Mexico, Netherlands, Servia, Sweden, and Switzerland.

Forgery.— Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Germany, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Counterfeiting of government acts.—Argentine Republic, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, Guatemala, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Switzerland, and Turkey.

Counterfeiting or altering money.— Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, Germany, Great Britain, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Introduction of counterfeiting tools.— Guatemala, and Mexico.

Embezzlement of public moneys.—Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Germany, Great Britain, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Embezzlement by employees.—Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, France, Great Britain, Guatemala, Haiti, Italy, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Larceny.— Argentine Republic, Belgium, Guatemala, Mexico, Netherlands, Peru, Russia, Servia, Sweden, and Switzerland.

Burglary.— Argentine Republic, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Great Britain, Guatemala, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Robbery.— Argentine Republic, Austria-Hungary, Belgium, Bolivia, Brazil, Chile, Colombia, Denmark, Ecuador, France, Germany, Guatemala, Haiti, Italy, Japan, Luxemburg, Mexico, Netherlands, Nicaragua, Norway, Peru, Russia, Salvador, Servia, Sweden, Switzerland, and Turkey.

Theft of horses or live stock.— Guatemala and Mexico.

Fraud.— Argentine Republic, Bolivia, Brazil, Chile, Denmark, Great Britain, Guatemala, Norway, Peru, Servia, Sweden, and Switzerland.

Obtaining money by threat.—Argentine Republic, Belgium, Guatemala, Luxemburg, and Mexico.

Receiving stolen goods.— Belgium, Guatemala, Luxemburg, Mexico, Netherlands, Servia, Sweden, and Switzerland.

Perjury or subornation of perjury.—Argentine Republic, Bolivia, Brazil, Chile, Colombia, Denmark, Great Britain, Guatemala, Japan, Norway, Peru, Servia, Sweden, and Switzerland.

Trading in slaves.— Argentine Republic, Bolivia, Chile, Denmark, Great Britain, Norway, Peru, Servia, and Sweden.

Mayhem.— Guatemala, and Mexico.

Bribery.— Mexico, and Brazil.

Attempts to commit crimes specified in treaty.— Belgium, Brazil, Guatemala, Luxemburg, Mexico, Netherlands, and Switzerland.

Participation in said crimes.— Argentine Republic, Bolivia, Brazil, Chile, Denmark Great Britain, Luxemburg, Netherlands, Norway, Peru, Servia, and Sweden.

The Treaties of the United States.— The following is a list of the treaties, conventions and agreements in force in the United States from 1778 to 1904:

LIST OF TREATIES, CONVENTIONS, ETC., BETWEEN THE UNITED STATES AND FOREIGN COUNTRIES, 1778–1904.

Countries	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Algiers	Treaty	Peace and amity in consideration of an annual payment	5 Sept. 1795	2 Mar. 1796	Superseded.
Algiers	Treaty	Peace and amity: The abolition of the annual payment	30 June 1815	26 Dec. 1815	Superseded.

TREATIES OF THE UNITED STATES WITH FOREIGN NATIONS

Countries	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Algiers	Treaty	Peace and amity	22–23 Dec. 1816	11 Feb. 1822	Became obsolete.
Argentine Repub.	Treaty	For the free navigation of the Rivers Parana and Uruguay	10 July 1853	9 April 1855	In force.
Argentine Repub.	Treaty	Friendship, Commerce and Navigation	27 July 1853	9 April 1855	In force.
Argentine Repub.	Convention	Extradition of Criminals	26 Sept. 1896	5 June 1900	In force.
Austria-Hungary	Treaty	Liberty of Commerce and Navigation	27 Aug. 1829	10 Feb. 1831	In force.
Austria-Hungary	Convention	Disposal of Personal Property and Consular Jurisdiction	8 May 1848	25 Feb. 1850	In force.
Austria-Hungary	Convention	Extradition of Criminals	3 July 1856	15 Dec. 1856	In force.
Austria-Hungary	Convention	Consular Convention	11 July 1870	29 June 1871	In force.
Austria-Hungary	Convention	Naturalization	20 Sept. 1870	21 Aug. 1871	In force.
Austria-Hungary	Convention	Registration of Trade Marks	25 Nov. 1871	1 June 1872	In force.
Baden	Convention	Extradition of Criminals	30 Jan. 1857	19 May 1857	*
Baden	Convention	Naturalization	19 July 1868	10 Jan. 1870	*
Bavaria	Convention	Abolishing Taxes on Emigration	21 Jan. 1845	15 Aug. 1846	*
Bavaria	Convention	Extradition of Criminals	12 Sept. 1853	18 Nov. 1854	*
Bavaria	Treaty	Naturalization	26 May 1868	8 Oct. 1868	*
Belgium	Treaty	Commerce and Navigation	10 Nov. 1845	31 Mar. 1846	Terminated.†
Belgium	Treaty	Commerce and Navigation	17 July 1858	19 April 1859	Terminated.†
Belgium	Convention	Regarding Import Duties and Capitalization of Scheldt Dues	20 May 1863	18 Nov. 1864	Superseded.
Belgium	Convention	Extinguishment of the Scheldt Dues	20 July 1863	18 Nov. 1864	In force.
Belgium	Convention	Naturalization	16 Nov. 1868	30 July 1869	Superseded.
Belgium	Convention	Consular Convention	5 Dec. 1868	7 Mar. 1870	Terminated.†
Belgium	Convention	Registration of Trade Marks	20 Dec. 1868	30 July 1869	Terminated.†
Belgium	Convention	Extradition of Criminals	19 Mar. 1874	1 May 1874	Terminated.‡
Belgium	Treaty	Liberty of Commerce and Navigation	8 Mar. 1875	29 June 1875	In force.
Belgium	Convention	Consular Convention	9 Mar. 1880	1 Mar. 1881	In force.
Belgium	Convention	Extradition of Criminals	13 June 1882	20 Nov. 1882	Superseded.
Belgium	Convention	Registration of Trade Marks	7 April 1884	9 July 1884	In force.
Belgium	Treaty	Extradition of Fugitives from Justice	26 Oct. 1901	14 June 1902	In force.
Bolivia	Treaty	Peace, Friendship, Commerce and Navigation	13 May 1858	8 Jan. 1863	In force.
Bolivia	Treaty	Extradition of Fugitives from Justice	21 April 1900	30 Dec. 1901	In force.
Borneo	Convention	Amity, Commerce and Navigation	23 June 1850	12 July 1854	In force.
Brazil	Treaty	Amity, Commerce and Navigation	12 Dec. 1828	18 Mar. 1829	Terminated.‖
Brazil	Convention	Securing payment of 530,000 milreis to satisfy claims of citizens of United States	27 Jan. 1849	19 Jan. 1850	Satisfied.
Brazil	Agreement	For the protection of Trade Marks	24 Sept. 1878	17 June 1879	In force.
Brazil	Treaty	Extradition of Criminals	28 May 1898	30 April 1903	In force.
Bremen **	.....	.....	.....	.....	.....
Brunswick and Luneburg	Convention	Respecting the disposition of personal property	21 Aug. 1854	30 July 1855	*
Central America	Convention	Peace, Amity, Commerce and Navigation	5 Dec. 1825	28 Oct. 1826	Abrogated.
Chile	Convention	Peace, Amity, Commerce and Navigation	16 May 1832	29 April 1834	Terminated.†
Chile	Convention	For arbitration of Macedonian Claims	10 Nov. 1858	22 Dec. 1859	Satisfied.
Chile	Convention	In adjustment of claims against Chile	7 Aug. 1892	28 Jan. 1893	Satisfied.
Chile	Protocol	Regarding claims of Patrick Shields.	24 May 1897		Satisfied.
Chile	Convention	For the amicable adjustment of claims	24 May 1897	12 Mar. 1900	Satisfied.
Chile	Treaty	Extradition of Criminals	17 April 1900	27 May 1902	In force.
China	Treaty	Peace, Amity and Commerce	3 July 1844	18 April 1846	Terminated.‖
China	Treaty	Peace, Amity and Commerce	18 June 1858	26 Jan. 1860	In force in so far as it is not modified by the treaty of 8 Oct. 1903.
China	Treaty	Establishing Trade Regulations and Tariff	8 Nov. 1858	.....	Became obsolete.
China	Convention	To establish claims against China	8 Nov. 1858	.....	Satisfied.
China	Treaty	Trade, Consuls and Emigration	4 July 1868	5 Feb. 1870	In force in so far as it is not modified by the treaty of 8 Oct. 1903.
China	Treaty	Immigration	17 Nov. 1880	5 Oct. 1881	In force.‖
China	Treaty	Commercial Intercourse and Judicial Procedure	17 Nov. 1880	5 Oct. 1881	In force in so far as it is not modified by the treaty of 8 Oct. 1903.
China	Convention	Regulation of Chinese Immigration	17 Mar. 1894	8 Dec. 1894	In force.
China	Treaty	Extension of Commercial Relations	8 Oct. 1903	13 Jan. 1904	In force.
Colombia (N. Gra.)	Treaty	Amity, Commerce and Navigation	3 Oct. 1824	31 May 1825	Expired.
Colombia (N. Gra.)	Treaty	Peace, Amity, Navigation and Commerce	12 Dec. 1846	12 June 1848	In force.‖
Colombia (N. Gra.)	Convention	Consular Convention	4 May 1850	5 Dec. 1851	In force.
Colombia (N. Gra.)	Convention	Satisfaction of claims against Colombia	10 Sept. 1857	8 Nov. 1860	Unsatisfied.
Colombia (N. Gra.)	Convention	Satisfaction of claims against Colombia	10 Feb. 1864	19 Aug. 1865	Satisfied.

TREATIES OF THE UNITED STATES WITH FOREIGN NATIONS

Countries	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Colombia	Convention	Extradition of Criminals	7 May 1888	6 Feb. 1891	In force.
Congo Independent States	Treaty	Amity, Commerce and Navigation	24 Jan. 1891	2 April 1892	In force.
Costa Rica	Treaty	Friendship, Commerce and Navigation	10 July 1851	26 May 1852	In force.
Costa Rica	Convention	Satisfaction of claims against Costa Rica	2 July 1860	11 Nov. 1861	Satisfied.
Cuba	Agreement	Naval and Coaling Stations in Cuba	16–23 Feb. '03	.....	In force.
Cuba	Lease	Coaling and Naval Stations	2 July 1903	.....	In force.
Cuba	Convention	To facilitate commercial intercourse	11 Dec. 1902	17 Dec. 1903	In force.
Denmark	Convention	Friendship, Commerce and Navigation	26 April 1826	14 Oct. 1826	Abrogated but renewed except Art. V. by convention of 11 Apr. 1857.
Denmark	Convention	Satisfaction of claims against Denmark	28 Mar. 1830	5 June 1830	Satisfied.
Denmark	Convention	Discontinuing Sound Dues	11 April 1857	13 Jan. 1858	In force.
Denmark	Convention	Consular Convention	11 July 1861	20 Sept. 1861	In force.
Denmark	Convention	Naturalization	20 July 1872	15 April 1873	In force.
Denmark	Agreement	Concerning claims of Carlos Butterfield & Co	6 Dec. 1888	24 May 1889	Disallowed.
Denmark	Convention	Protection of Trade Marks and Labels	15 June 1892	12 Oct. 1892	In force.
Denmark	Treaty	Extradition of Fugitives from Justice	6 Jan. 1902	17 April 1902	In force.
Dominican Repub.	Convention	Amity, Commerce, Navigation and Extradition	8 Feb. 1867	24 Oct. 1867	Terminated.†
Ecuador	Treaty	Peace, Friendship, Navigation, and Commerce	13 June 1839	23 Sept. 1842	Terminated.†
Ecuador	Convention	Satisfaction of claims againt Ecuador	25 Nov. 1862	8 Sept. 1864	Satisfied.
Ecuador	Convention	Naturalization	6 May 1872	24 Nov. 1873	Terminated.†
Ecuador	Convention	Extradition of Criminals	28 June 1872	24 Dec. 1873	In force.
Ecuador	Convention	Satisfaction of claims of Julio R. Santos	28 Feb. 1893	7 Nov. 1894	Satisfied.
Egypt	Agreement	Regarding commercial affairs	16 Nov. 1884	7 May 1885	In force.
France	Treaty	Amity and Commerce	6 Feb. 1778	.....	Abrogated, 1798.
France	Treaty	Alliance to carry on the war with Great Britain	6 Feb. 1778	.....	Abrogated, 1798.
France	Contract	For repayment of war loans	16 July 1782	.....	Satisfied.
France	Contract	For new and repayment of old loans	25 Feb. 1783	.....	Satisfied.
France	Convention	Consular Convention	14 Nov. 1788	.....	Abrogated, 1798.
France	Treaty	Peace, Commerce and Navigation	30 Sept. 1800	21 Dec. 1801	Expired by limitations.
France	Treaty	For the Cession of Louisiana	30 April 1803	21 Oct. 1803	In force.
France	Convention	For Payment of Purchase of Louisiana	30 April 1803	21 Oct. 1803	Satisfied.
France	Convention	Satisfaction of claims against France	30 April 1803	21 Oct. 1803	Satisfied.
France	Convention	Navigation and Commerce	24 June 1822	12 Feb. 1823	In force.
France	Convention	Claims and duties on wines and cotton	4 July 1831	13 July 1832	Satisfied.
France	Convention	Extradition of Criminals	9 Nov. 1843	13 April 1844	In force.
France	Article	Addition to Extradition Convention	24 Feb. 1845	24 July 1845	In force.
France	Convention	Consular Convention	23 Feb. 1853	12 Aug. 1853	In force.
France	Article	Addition to Extradition Convention.	10 Feb. 1858	14 Feb. 1859	In force.
France	Convention	Protection of Trade Marks	16 April 1869	6 July 1869	In force.
France	Convention	Satisfaction of war claims	15 Jan. 1880	25 June 1880	Satisfied.
France	Convention	Extension of term of Claim Commission	19 July 1882	29 Dec. 1882	.....
France	Convention	Extension of term of Claim Commission	8 Feb. 1883	25 June 1883	.....
France	Agreement	Commercial Reciprocity	28 May 1898	1 June 1898	In force.
France	Agreement	Additional Agreement of Reciprocity	2 Aug. 1902	22 Aug. 1902	In force.
France	Treaty	Relations in Tunis	15 Mar. 1904	9 May 1904	In force.
German Empire	Convention	Regulating Consular Affairs and Trade Marks	11 Dec. 1871	1 June 1872	In force
German Empire††	General Act	Neutrality and Autonomous Government of the Samoan Islands	14 June 1889	21 May 1890	Annulled by treaty of 2 Dec. 1899 for the adjustment of jurisdiction.
German Empire ††	Convention	Amicable Adjustment of Jurisdiction in Samoa	2 Dec. 1899	16 Feb. 1900	In force.
German Empire ††	Convention	Settlement of Samoan Claims by Arbitration	7 Nov. 1899	8 Mar. 1900	Satisfied.
German Empire	Agreement	Regarding commercial affairs	10 July 1900	.....	In force.
Great Britain	Treaty	Provisional Treaty of Peace	30 Nov. 1782	11 April 1783	Abrogated.
Great Britain	Treaty	Peace and Amity	3 Sept. 1783	14 Jan. 1784	Abrogated.
Great Britain	Treaty	Amity, Commerce and Navigation	19 Nov. 1794	29 Feb. 1796	Terminated.‡‡
Great Britain	Convention	Relating to passage of Indians between the two countries	4 May 1796	.....	Terminated.‡‡
Great Britain	Article	Explanatory to Article V., Treaty of 1794	15 Mar. 1798	.....	Terminated.‡‡
Great Britain	Convention	For payment of indemnities, etc	8 Jan. 1802	27 April 1802	Terminated.‡‡
Great Britain	Treaty	Peace and Amity	24 Dec. 1814	18 Feb. 1815	In force.
Great Britain	Convention	Commerce and Navigation	3 July 1815	22 Dec. 1815	In force.
Great Britain	Convention	Respecting Fisheries, Boundary and the Restoration of Slaves	20 Oct. 1818	30 Jan. 1819	Terminated.‖
Great Britain	Convention	Settlement of claims against Great Britain	3 Jan. 1823	11 Jan. 1823	Unsatisfied.

TREATIES OF THE UNITED STATES WITH FOREIGN NATIONS

Countries	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Great Britain	Convention	Settlement of claims against Great Britain	13 Nov. 1826	19 Mar. 1827	Satisfied.
Great Britain	Convention	Respecting the boundary from the Rocky Mountains to the Pacific Ocean	6 Aug. 1827	15 May 1828	In force.
Great Britain	Convention	Respecting commercial affairs.....	6 Aug. 1827	15 May 1828	In force.
Great Britain	Convention	Relative to the Northeastern Boundary	20 Sept. 1827	15 May 1828	Determined, 1842.
Great Britain	Convention	Boundary, Suppression of Slave Trade and Extradition.....	9 Aug. 1842	10 Nov. 1842	In force.
Great Britain	Treaty	Establishing Boundary West of the Rocky Mountains	15 June 1846	5 Aug. 1846	In force.
Great Britain	Convention	Relative as to Ship Canal between Atlantic and Pacific Oceans (The Clayton-Bulwer Treaty)	19 April 1850	5 July 1850	Superseded.
Great Britain	Convention	Settlement of claims	8 Feb. 1853	20 Aug. 1853	Satisfied.
Great Britain ...	Treaty	Relative to Fisheries, Duties and Navigation in British North America	5 June 1854	11 Sept. 1854	Terminated.§§
Great Britain	Convention	Extension of term of Claim Commission	17 July 1854	11 Sept. 1854	Satisfied.
Great Britain	Treaty	For Suppression of African Slave Trade	7 April 1862	7 June 1862	In force but modified by treaty of 3 June 1870.
Great Britain	Article	Additional to Slave Trade Treaty...	17 Feb. 1863	22 April 1873	In force.
Great Britain	Treaty	Settlement of claims.....	1 July 1863	5 Mar. 1864	Satisfied.
Great Britain	Convention	Naturalization	13 May 1870	16 Sept. 1870	In force.
Great Britain	Convention	For the Suppression of Slave Trade.	3 June 1870	16 Sept. 1870	In force.
Great Britain	Convention	Renunciation of Naturalization.....	23 Feb. 1871	5 May 1871	In force.
Great Britain	Treaty	For the Settlement of All Causes of Difference	8 May 1871	4 July 1871	Certain articles still in force.
Great Britain	Article	Additional to Treaty of 8 May 1871	18 Jan. 1873	15 April 1873	In force.
Great Britain	Declaration	Affording Protection to Trade Marks	24 Oct. 1877	17 July 1878	.....
Great Britain	Convention	Extradition of Criminals.....	12 July 1889	25 Mar. 1890	In force.
Great Britain	Convention	Relating to Fur Seals in Bering Sea	29 Feb. 1892	9 May 1892	In force.
Great Britain	Convention	Prohibiting the killing of fur seals during arbitration	18 April 1892	9 May 1892	Determined.
Great Britain	Treaty	For the Recovery of Deserters from Merchant Vessels	3 June 1892	1 Aug. 1892	In force.
Great Britain	Convention	For Delimiting Boundaries not Permanently Marked	22 July 1892	26 Aug. 1892	.....
Great Britain	Convention	Extending the Terms of the Alaskan Boundary Commission	3 Feb. 1894	28 Mar. 1894	.....
Great Britain	Convention	Settlement of claims	8 Feb. 1896	11 June 1896	Satisfied.
Great Britain	Convention	Tenure and Disposition of Real and Personal Property.....	2 Mar. 1899	6 Aug. 1900	In force.
Great Britain	Treaty	Supplementary to Extradition Convention	19 Dec. 1900	22 April 1901	In force.
Great Britain	Treaty	To facilitate the construction of a ship canal	18 Nov. 1901	22 Feb. 1902	In force.
Great Britain ...	Treaty	Import duties in Zanzibar.....	31 May 1902	17 Oct. 1902	In force.
Great Britain	Convention	Relative to the Alaskan Boundary..	24 Jan. 1903	3 Mar. 1903	In force.
Great Britain	Treaty	Light and harbor dues in Zanzibar..	5 June 1903	24 Dec. 1903	In force.
Great Britain	Agreement	Protection of Trade Marks in Morocco	6 Dec. 1899	.....	In force.
Greece	Treaty	Commerce and Navigation.....	22 Dec. 1837	30 Aug. 1838	In force.
Greece	Convention	Consular	2 Dec. 1902	11 July 1903	In force.
Guatemala	Treaty	Peace, Friendship, Commerce and Navigation	3 Mar. 1849	28 July 1852	Terminated.
Guatemala	Agreement	For Arbitration of the claim of Robert H. May	23 Feb. 1900	.....	Satisfied.
Guatemala	Agreement	For Arbitration of the claim of Robert H. May, Supplementary.....	10 May 1900	.....	.....
Guatemala	Convention	Protection of Trade Marks and Labels	15 April 1901	11 April 1902	In force.
Guatemala	Convention	Real and Personal Property.....	27 Aug. 1901	18 Sept. 1902	In force.
Guatemala	Treaty	Extradition of Fugitives from Justice	27 Feb. 1903	17 July 1903	In force.
Haiti	Treaty	Amity, Commerce, Navigation and Extradition	3 Nov. 1864	6 July 1865	In force.
Haiti	Agreement	Relative to claim by Charles A. Van Bokkelen	24 May 1888	.....	.....
Haiti	Agreement	Relative to claim by John D. Metzgar & Co.....	18 Oct. 1899	.....	.....
Haiti	Treaty	Naturalization	22 Mar. 1902	24 Mar. 1904	In force.
Haiti	Treaty	Naturalization, Supplementary	22 Feb. 1903	24 Mar. 1904	In force.
Hanover	Treaty	Commerce and Navigation	20 May 1840	2 Jan. 1841	Superseded.
Hanover	Treaty	Commerce and Navigation	10 June 1846	24 April 1847	Terminated.
Hanover	Treaty	Extradition of Criminals	18 Jan. 1855	5 May 1855	Terminated.
Hanover	Convention	Abolishing Stade Dues	6 Nov. 1861	17 June 1862	Terminated.
Hanseatic Rep.|| ||	Convention	Friendship, Commerce and Navigation	20 Dec. 1827	2 June 1828	Superseded.
Hanseatic Rep.|| ||	Convention	Relating to arrest of deserters.....	4 June 1828	29 July 1829	Superseded.
Hanseatic Rep.|| ||	Convention	Consular	30 April 1852	6 June 1853	Superseded.
Hawaiian Islands.	Treaty	Friendship, Commerce, Extradition and Navigation	20 Dec. 1849	9 Nov. 1850	Terminated.
Hawaiian Islands.	Treaty	Commercial Reciprocity	30 Jan. 1875	3 June 1875	Terminated.
Hawaiian Islands.	Treaty	Additional Reciprocity	6 Dec. 1884	9 Nov. 1887	Terminated.
Hesse	Convention	Abolishing Taxes on Emigration....	26 Mar. 1844	8 May 1845	In force.
Hesse	Convention	Naturalization	1 Aug. 1868	31 Aug. 1869	In force.

COUNTRIES	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Honduras	Treaty	Friendship, Commerce and Navigation	4 July 1864	30 May 1865	In force.
Italy	Convention	Consular	8 Feb. 1868	23 Feb. 1869	Superseded.
Italy	Convention	Extradition of Criminals	23 Mar. 1868	30 Sept. 1868	In force.
Italy	Convention	Consular	21 Jan. 1869	11 May 1869	Expired.
Italy	Convention	Additional to Extradition Convention, 1868	21 Jan. 1869	11 May 1869	In force.
Italy	Treaty	Commerce and Navigation	26 Feb. 1871	23 Nov. 1871	In force.
Italy	Convention	Consular	8 May 1878	27 Sept. 1878	In force.
Italy	Convention	Supplemental to Consular Convention of 1878	24 Feb. 1881	29 June 1881	In force.
Italy	Declaration	Protection of Trade Marks	1 June 1882	19 Mar. 1884	In force.
Italy	Convention	Additional to Extradition Convention, 1868	11 June 1884	24 April 1885	In force.
Japan	Treaty	Peace, Amity and Commerce	31 Mar. 1854	22 June 1855	Superseded
Japan	Treaty	Commercial and Consular	17 June 1857	30 June 1858	Superseded
Japan	Treaty	Commerce and Navigation	29 July 1858	23 May 1860	Superseded
Japan	Convention	Establishing tariff of duties	25 June 1866	.....	Superseded
Japan	Convention	Relating to Commercial Affairs	25 July 1878	8 April 1879	In force.
Japan	Treaty	Extradition of Fugitives from Justice	29 April 1886	3 Nov. 1886	In force.
Japan	Treaty	Commerce and Navigation	22 Nov. 1894	21 Mar. 1895	In force.
Japan	Convention	Patents, Trade Marks and Designs	13 Jan. 1897	9 Mar. 1897	Superseded
Korea	Treaty	Peace, Amity, Commerce and Navigation	22 May 1882	4 June 1883	In force.
Lew Chew	Compact	Friendship and Commerce	11 July 1854	9 Mar. 1855	In force.
Liberia	Treaty	Commerce and Navigation	21 Oct. 1862	18 Mar. 1863	In force.
Luxemburg	Convention	Extradition of Criminals	29 Oct. 1883	12 Aug. 1884	In force.
Madagascar	Treaty	Commerce and Navigation	14 Feb. 1867	1 Oct. 1868	Superseded
Madagascar	Treaty	Friendship and Commerce	13 May 1881	13 Mar. 1883	Terminated
Mecklenburg-Schwerin**	Treaty	Commerce and Navigation	9 Dec. 1847	2 Aug. 1848	Superseded.‖
Mecklenburg-Strelitz**	.....	.....	.....	.....	.....
Mexico	Treaty	Limits of boundary	12 Jan. 1828	5 April 1832	Obsolete.
Mexico	Treaty	Limits of boundary	5 April 1831	5 April 1832	Expired.
Mexico	Treaty	Amity, Commerce and Navigation	5 April 1831	5 April 1832	Terminated.
Mexico	Treaty	Limits of boundary	3 April 1835	21 April 1836	Expired.
Mexico	Convention	Settlement of claims	11 April 1839	8 April 1840	Satisfied.
Mexico	Convention	Settlement of claims	30 Jan. 1843	30 Mar. 1843	Satisfied.
Mexico	Treaty	Peace, Friendship, Limits and Settlement	2 Feb. 1848	4 July 1848	In force.
Mexico	Treaty	Boundary, Cession of Territory, etc. (Gadsden Treaty)	30 Dec. 1853	30 June 1854	In force.
Mexico	Treaty	Extradition of Fugitives from Justice	11 Dec. 1861	20 June 1862	Terminated.§
Mexico	Convention	Settlement of claims	4 July 1868	1 Feb. 1869	Satisfied.
Mexico	Convention	Naturalization	10 July 1868	1 Feb. 1869	Terminated.§
Mexico	Convention	Extension of Claims Convention of 1868	19 April 1871	8 Feb. 1872	Expired.
Mexico	Convention	Extension of Claims Convention of 1868	27 Nov. 1872	24 July 1873	Expired.
Mexico	Convention	Extension of Claims Convention of 1868	20 Nov. 1874	28 Jan. 1875	Expired.
Mexico	Convention	Extension of Claims Convention of 1868	29 April 1876	29 June 1876	Satisfied.
Mexico	Convention	Relating to boundary limits	29 July 1882	5 Mar. 1883	Terminated.‖
Mexico	Convention	Commercial Reciprocity	20 Jan. 1883	2 June 1884	Expired.
Mexico	Convention	Rio Grande and Rio Colorado Boundary	12 Nov. 1884	14 Sept. 1886	In force.
Mexico	Convention	Commercial Reciprocity	25 Feb. 1885	4 May 1886	Expired.
Mexico	Convention	Extension of time for Boundary Commission	5 Dec. 1885	28 June 1887	Expired.
Mexico	Convention	Commercial Reciprocity	14 May 1886	1 Feb. 1887	Expired.
Mexico	Convention	Revival of expired boundary commission	18 Feb. 1889	14 Oct. 1889	Expired.
Mexico	Convention	Limits of boundary	1 Mar. 1889	26 Dec. 1890	In force.
Mexico	Convention	Extension of boundary convention	24 Aug. 1894	18 Oct. 1894	Expired.
Mexico	Convention	Extension of boundary convention	1 Oct. 1895	21 Dec. 1895	Expired.
Mexico	Convention	Extension of boundary convention	6 Nov. 1896	23 Dec. 1896	Expired.
Mexico	Convention	Extension of boundary convention	29 Oct. 1897	21 Dec. 1897	Expired.
Mexico	Convention	Extension of boundary convention	2 Dec. 1898	3 Feb. 1899	Expired.
Mexico	Convention	Extradition of Fugitives from Justice	22 Feb. 1899	24 April 1899	In force.
Mexico	Treaty	Extension of boundary convention	22 Dec. 1899	7 May 1900	Expired.
Mexico	Convention	Extension of boundary convention	21 Nov. 1900	24 Dec. 1900	In force.
Mexico	Protocol	Relative to the adjustment of "The Pious Fund of the Californians"	22 May 1902	.....	Satisfied.
Mexico	Convention	Supplemental to Extradition Convention	25 June 1902	3 April 1903	In force.
Mexico	Agreement	Reciprocal right to pursue savage Indians across the boundaries	25 June 1890	.....	Expired.
Mexico	Convention	Relative to the Rio Grande boundary	1 Mar. 1889	26 Dec. 1890	.....
Mexico	Agreement	Right to pursue savage Indians	25 Nov. 1892	.....	Expired.
Mexico	Agreement	Right to pursue savage Indians	4 June 1896	.....	In force.
Mexico	Agreement	Relative to claims of Oberlander and Messenger	2 May 1897	.....	Satisfied.
Morocco	Treaty	Peace and Friendship	Jan. 1787	.....	Superseded.
Morocco	Treaty	Peace and Friendship	16 Sept. 1836	30 Jan. 1837	In force.
Morocco	Convention	Relative to Cape Spartel Light-house	31 May 1865	12 Mar. 1867	In force.
Morocco	Convention	Relative to Protection	3 July 1880	21 Dec. 1881	In force.
Muscat (1)	Treaty	Amity and Commerce	21 Sept. 1833	24 June 1837	In force but modified by treaty of 5 June 1903 with Great Britain.

Countries	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Nassau	Convention	Abolishing Emigration Taxes	27 May 1846	26 Jan. 1847	Terminated.
Netherlands, The.	Treaty	Peace and Commerce	8 Oct. 1782	.....	Abrogated.
Netherlands, The.	Convention	Relative to Recaptured Vessels	8 Oct. 1782	.....	Abrogated.
Netherlands, The.	Treaty	Commerce and Navigation	19 Jan. 1839	24 May 1839	In force, except Articles I. and II.
Netherlands, The.	Convention	Commerce and Navigation	26 Aug. 1852	25 Feb. 1853	In force.
Netherlands, The.	Convention	Relative to Consular office	22 Jan. 1855	26 May 1855	Superseded.
Netherlands, The.	Convention	Relative to Consular office	23 May 1878	1 Aug. 1879	In force.
Netherlands, The.	Convention	Extradition of Criminals	22 May 1880	30 July 1880	Superseded.
Netherlands, The.	Convention	Extradition of Criminals	2 June 1887	21 June 1889	In force.
Netherlands, The.	Treaty	Supplementary Extradition	18 Jan. 1904	31 May 1904	In force.
Nicaragua	Treaty	Friendship, Commerce, Navigation and Isthmian Transit	21 June 1867	13 Aug. 1868	Terminated.
Nicaragua	Convention	Extradition of Criminals	25 June 1870	19 Sept. 1871	Terminated.
Nicaragua	Agreement	Settlement of claim of Orr and others	22 Mar. 1900	.....	In force.
North German Union	Convention	Naturalization	22 Feb. 1868	27 May 1868	In force.
Norway	Convention	Extradition of Criminals	7 June 1893	9 Nov. 1893	In force.
Oldenburg**	.....	.....	.....	.....	.....
Orange Free State	Convention	Friendship, Commerce and Navigation	22 Dec. 1871	23 Aug. 1873	Terminated.
Orange Free State	Treaty	Extradition of Criminals	28 Oct. 1896	21 April 1899	Terminated.
Panama	Treaty	Relative to a ship canal across the Isthmus of Panama	18 Nov. 1903	26 Feb. 1904	In force.
Paraguay	Convention	Settlement of claims	4 Feb. 1859	12 Mar. 1860	Satisfied.
Paraguay	Treaty	Friendship, Commerce and Navigation	4 Feb. 1859	12 Mar. 1860	In force.
Persia	Treaty	Friendship and Commerce	13 Dec. 1856	18 Aug. 1857	In force.
Peru	Convention	Settlement of claims	17 Mar. 1841	8 Jan. 1847	Satisfied.
Peru	Treaty	Friendship, Commerce and Navigation	26 July 1851	19 July 1852	Terminated.†
Peru	Convention	Declaring the Principles of the Rights of Neutrals at Sea	22 July 1856	2 Nov. 1857	In force.
Peru	Convention	Relative to whaling ships	4 July 1857	14 Oct. 1858	Terminated.†
Peru	Convention	Settlement of claims	20 Dec. 1862	19 May 1863	Dropped.
Peru	Convention	Settlement of claims	12 Jan. 1863	19 May 1863	Satisfied.
Peru	Convention	Settlement of claims	4 Dec. 1868	6 July 1869	Satisfied.
Peru	Treaty	Friendship, Commerce and Navigation	6 Sept. 1870	27 July 1874	Terminated.†
Peru	Treaty	Extradition of Criminals	12 Sept. 1870	27 July 1874	Terminated.†
Peru	Treaty	Friendship, Commerce and Navigation	31 Aug. 1887	7 Nov. 1888	Terminated.†
Peru	Agreement	Settlement of MacCord claim	17 May 1898	.....	Satisfied.
Peru	Treaty	Extradition of Criminals	28 Nov. 1899	29 Jan. 1901	In force.
Peru-Bolivia	Convention	Friendship, Commerce and Navigation	30 Nov. 1836	3 Oct. 1838	Terminated.
Portugal	Treaty	Commerce and Navigation	26 Aug. 1840	24 April 1841	Terminated.†
Portugal	Convention	Settlement of claim of Brig.-Gen. Armstrong	26 Feb. 1851	1 Sept. 1851	Satisfied.
Portugal	Convention	Relative to Delagoa Bay	13 June 1891	.....	In force
Portugal	Treaty	Commercial Reciprocity	24 July 1897	12 June 1900	In force.
Prussia	Treaty	Amity and Commerce	10 Sept. 1785	.....	Expired.(2)
Prussia	Treaty	Amity and Commerce	11 July 1799	4 Nov. 1800	Expired.(2)
Prussia	Treaty	Commerce and Navigation	1 May 1828	14 Mar. 1829	In force.
Prussia	Convention	Extradition of Criminals	16 June 1852	1 June 1853	In force.(3)
Rumania	Convention	Relative to Consular office	17 June 1881	9 July 1883	In force.
Russia	Convention	As to the Pacific Ocean and Northwest Coast of America	17 April 1824	12 Jan. 1825	In force.
Russia	Treaty	Commerce and Navigation	18 Dec. 1832	11 May 1833	In force.
Russia	Convention	As to Rights of Neutrals at Sea	22 July 1854	1 Nov. 1854	In force.
Russia	Convention	Ceding Alaska	30 Mar. 1867	20 June 1867	In force.
Russia	Treaty	Additional to Treaty of Commerce of 1832	27 Jan. 1868	15 Oct. 1868	In force.
Russia	Declaration	Relative to Trade Marks	28 Mar. 1874	24 Nov. 1874	In force.
Russia	Convention	Extradition of Criminals	28 Mar. 1887	5 June 1893	In force.
Russia	Agreement	For a modus vivendi in relation to the fur seal fisheries in Bering Sea, etc.	4 May 1894	12 May 1894	In force.
Salvador	Convention	Amity, Navigation and Commerce	2 Jan. 1850	18 April 1853	Superseded.
Salvador	Convention	Extradition of Criminals	23 May 1870	4 Mar. 1874	Terminated.
Salvador	Treaty	Amity, Commerce and Consular Privileges	6 Dec. 1870	13 Mar. 1874	Terminated.†
Salvador	Convention	Relative to Amity, Commerce, etc.	12 May 1873	13 Mar. 1874	Expired.
Salvador	Agreement	Settlement of claims	12 Dec. 1901	.....	.....
Samoan Islands.	Treaty	Friendship and Commerce	17 Jan. 1878	13 Feb. 1878	Terminated.
Samoan Islands.	General Act	Neutrality and Autonomous Government of Samoa (4)	14 June 1889	21 May 1890	Terminated.
Sardinia	Treaty	Commerce and Navigation	26 Nov. 1838	18 Mar. 1839	Terminated.
Saxony	Convention	Abolishing Emigration Taxes	14 May 1845	9 Sept. 1846	In force.
Servia	Convention	Commerce and Navigation	14 Oct. 1881	27 Dec. 1882	In force.
Servia	Convention	Relative to Consular office	14 Oct. 1881	27 Dec. 1882	In force.
Servia	Treaty	Extradition of Fugitives from Justice	25 Oct. 1901	17 May 1902	In force.
Siam	Convention	Amity and Commerce	20 Mar. 1833	24 June 1837	Modified.‖
Siam	Treaty	Amity and Commerce	29 May 1856	16 Aug. 1858	In force.
Siam	Agreement	Regulating Liquor Traffic	14 May 1884	5 July 1884	In force.
Spain (5)	Treaty	Friendship, Boundaries, Commerce and Navigation	27 Oct. 1795	2 Aug. 1796	Expired.
Spain (5)	Convention	Settlement of claims	11 Aug. 1802	22 Dec. 1818	Expired.
Spain (5)	Treaty	Friendship, Cession of the Floridas and Boundaries	22 Feb. 1819	22 Feb. 1821	In force.
Spain (5)	Convention	Settlement of claims of U. S. Government	17 Feb. 1834	1 Nov. 1834	Satisfied.
Spain (5)	Convention	Extradition of Criminals	5 July 1877	22 Feb. 1877	Terminated.
Spain (5)	Convention	Relative to Trade Mark	19 June 1882	19 April 1883	Terminated.

Countries	Character of Document	Subject of Document	Signed	Proclaimed	Disposition
Spain (5)	Convention	vention			
		Supplementary to Extradition Con-	7 Aug. 1882	19 April 1883	Terminated.
Spain (5)	Treaty	Peace	10 Dec. 1898	11 April 1899	In force.
Spain (5)	Treaty	Cession of outlying islands of the Philippines	7 Nov. 1900	23 Mar. 1901	In force.
Spain (5)	Agreement	Relative to autbenticity of signatures	7 Aug. 1901	28 Nov. 1901	In force.
Spain (5)	Treaty	Friendship and General Relations	3 July 1902	20 April 1903	In force.
Sweden	Treaty	Amity and Commerce	3 April 1783	25 Sept. 1783	Terminated(2)
Sweden	Treaty	Amity and Commerce	4 Sept. 1816	31 Dec. 1818	Expired.
Sweden	Treaty	Commerce and Navigation	4 July 1827	19 Jan. 1828	In force.
Sweden	Convention	Extradition of Criminals	21 Mar. 1860	21 Dec. 1895	Superseded.
Sweden	Convention	Naturalization	26 May 1869	12 Jan. 1872	In force.
Sweden	Treaty	Extradition of Fugitives from Justice	14 Jan. 1893	18 Mar. 1893	In force.
Switzerland	Convention	Relative to Property Rights	18 May 1847	4 May 1848	Superseded.
Switzerland	Convention	Friendship, Commerce, and Extradition	25 Nov. 1850	9 Nov. 1855	In force.‖
Switzerland	Treaty	Extradition of Criminals	14 May 1900	28 Feb. 1901	In force.
Texas	Convention	Settlement of claims	11 April 1838	6 July 1838	Satisfied.
Texas	Convention	Relative to boundary	25 April 1838	13 Oct. 1838	Obsolete.
Tonga	Treaty	Amity, Commerce and Navigation	2 Oct. 1886	18 Sept. 1888	In force.
Tripoli	Treaty	Peace and Friendship	4 Nov. 1796	10 June 1797	Superseded.
Tripoli	Treaty	Peace and Amity	4 June 1805	(?)	.....
Tunis	Treaty	Amity, Commerce and Navigation	Aug. 1797	.....	Superseded.‖
Tunis	Convention	Amity and Navigation	24 Feb. 1824	21 Jan. 1825	In force.
Turkey	Treaty	Commerce and Navigation	7 May 1830	4 Feb. 1832	In force.
Turkey	Treaty	Commerce and Navigation	25 Feb. 1862	2 July 1862	Terminated.†
Turkey	Treaty	Extradition of Criminals	11 Aug. 1874	26 May 1875	In force.
Turkey	Agreement	Right to hold real estate in Turkey	11 Aug. 1874	29 Oct. 1874	In force.
Two Sicilies	Convention	Settlement of claims	14 Oct. 1832	27 Aug. 1833	Satisfied.
Two Sicilies	Treaty	Commerce and Navigation	1 Dec. 1845	24 July 1846	Superseded.
Two Sicilies	Convention	Relative to Rights of Neutrals at Sea	13 Jan. 1855	16 July 1855	Superseded.
Two Sicilies	Convention	Amity, Commerce, Navigation and Extradition	1 Oct. 1855	10 Dec. 1856	Obsolete.
Venezuela	Treaty	Peace, Amity, Commerce and Navigation	20 Jan. 1836	30 June 1836	Terminated.†
Venezuela	Convention	Settlement of claim	14 Jan. 1859	.....	Satisfied.
Venezuela	Treaty	Amity, Commerce, Navigation and Extradition	27 Aug. 1860	25 Sept. 1861	Terminated.†
Venezuela	Convention	Settlement of claims	25 April 1866	29 May 1867	Satisfied.
Venezuela	Convention	Settlement of claims	5 Dec. 1885	4 June 1889	.....
Venezuela	Convention	Relative to removal of doubts	15 Mar. 1888	4 June 1889	.....
Venezuela	Convention	Relative to extension of time	5 Oct. 1888	4 June 1889	Satisfied.
Venezuela	Convention	Settlement of claim	19 Jan. 1892	30 July 1894	Satisfied.
Würtemberg**	Convention	Abolishing Taxes on Emigration	10 April 1844	16 Dec. 1844	In force.
Würtemberg**	Convention	Naturalization and Extradition	27 July 1868	7 Mar. 1870	In force.
Zanzibar	Treaty	Duties on Liquors and Consular Powers	3 July 1886	17 Aug. 1888	In force.

Notes.— * The formation of the German Empire in 1871 by the consolidation of the North German Union, etc., has, in some instances abrogated the treaties entered into with the independent German governments now embraced in the empire. † Upon notice of foreign power. ‡ On exchange of ratifications of the treaty of 1882. § See also Peru and Bolivia. ‖ In part. ** Acceded to extradition treaty between United States and Prussia. †† Great Britain also a party. ‡‡ By the War of 1812. §§ Upon notice by the United States. ‖‖ Bremen, Hamburg, and Lubeck. (1) See Zanzibar. (2) Revived in part. (3) Concluded for Prussia and other states of the Germanic Confederation; others acceded. (4) Great Britain and Germany also parties. (5) All treaties with Spain prior to the treaty of peace were annulled by treaty of 3 July 1902, except treaty of 1834.

Revised by Sydney Smith,
Of the State Department, Washington.

John R. Meader,
Editor 'American Year Book.'

Treaty, an agreement, league, or contract between two or more nations formally signed by commissioners properly authorized, and ratified by the supreme power of each state. Treaties are of various kinds, as treaties for regulating commercial intercourse, treaties of alliance, offensive and defensive, treaties of peace, etc. In most monarchies the power of making and ratifying treaties is vested in the sovereign; in republics it is vested in the chief magistrate, senate, or executive council; in the United States it is vested in the President by and with the consent of the Senate.

Treaty of Portsmouth. See Portsmouth, Treaty of.

Treaty, Anglo-Japanese. See Anglo-Japanese Treaty.

Treaty Elm, a celebrated tree, formerly in the environs of Philadelphia, Pa., under which William Penn (q.v.) negotiated a treaty with the Indians. A monument marks its place.

Treaty Port, a port open to commerce with certain nations in accordance with the terms of a treaty, in a country not generally open to foreign commerce. China is the one nation where treaty ports are now of importance; the first ports were opened to trade by the Nankin treaty with Great Britain in 1842; these ports were Canton, Amoy, Fu-Chau, Ningpo, and Shanghai. Since then other treaty ports have been established, most recently by the treaty with Japan in 1895, and by the treaty with the powers in 1902. They now number over 30, and include Samshui, Wuchow, Whuhu, Shasi, Chung-King (the farthest inland), Yochow, Hangchow, Su-Chau, Lungchow, Niu-Chwang (the most northern), Chang-Sha, Ngan-King, Wan-Hsien, Wai-Chau, and Kong-Mun. Japan was also first opened to foreign commerce by means of treaty ports; the first treaty in March 1854 with the United States opened two ports, Simoda and Hakodadi, to American commerce; in the same year the British gained access to two ports, and later the Dutch and the Russians; by subsequent treaties both the United States and Great Britain gained more ports

and further privileges. In 1899, however, Japan was recognized as on an equality with the other powers, and the whole country thrown open to foreign trade. See CHINA, *Trade and Commerce;* JAPAN, *History.*

Trebbia, trĕb'bē-ä, Italy, a tributary of the Po which rises in the mountains of Liguria. It was on the banks of the Trebbia that the Romans under Sempronius were defeated 218 B.C., by the Carthaginians under Hannibal.

Trebizond, trĕb'ĭ-zŏd, Asia Minor, (1) A seaport, military station and capital of a vilayet of the same name, in the northwestern extremity on the Muchka where it enters the Black Sea, 120 miles northwest of Erzerum. It has a citadel, mosques, and churches; its streets are irregular and narrow. It is the see of an Armenian archbishop, a United Armenian bishop, and a Greek metropolitan. Its trade is important. The exports consist of tobacco, carpets, silks, reins, cattle, raisins, walnuts and hazelnuts. The imports are cotton and woolen manufactures, sugar and silks. Trebizond is the residence of foreign consuls. Pop. 40,000. (2) The vilayet or province has an area of 12,387 square miles. It has great mineral riches and extensive forests, and a mixed population. Pop. 1,164,000.

Treble. See SOPRANO.

Treb'uchet. See ORDNANCE.

Tree, Herbert Beerbohm, English actor: b. London 17 Dec. 1853. He is a son of Julius Beerbohm, and was educated in England and Germany. After entering upon a business career he became interested in private theatricals, and adopted the profession of the stage in 1878. Succeeding in this, he assumed the management of the Haymarket Theatre in 1887, and has been one of the most conspicuous of the actor-managers of recent times. Since 1897 he has played in his own theatre, Her Majesty's, one of the best constructed of London playhouses. He possesses great versatility, and has played parts ranging from Hamlet to Falstaff. Tree achieved an early success in 'The Private Secretary' (1884). This was followed by Macari in 'Called Back,' and by the part of the Russian Spy in 'The Red Lamp' (1887). In eccentric character parts he has essayed the leading roles in 'The Ballad-Monger' and in 'Trilby.' In modern social drama he has appeared in 'A Bunch of Violets,' 'Captain Swift,' 'A Woman of No Importance,' 'John-a-Dreams,' 'The Dancing-Girl,' and 'The Tempter'; while of Shakespearian plays he has produced 'Merry Wives of Windsor,' 'Hamlet,' 'Henry IV.,' and 'The Taming of the Shrew.' Stephen Phillips' 'Herod' was written for him. In 1803 he lectured before the Royal Institution on "The Imaginative Faculty."

Tree-cat, a palm-civet. See PALM CAT.

Tree-creeper, a bird (*Certhea*). See CREEPER.

Tree-cricket, one of the small, almost colorless crickets of the genus *Œcanthus,* specifically the snowy cricket (*Œ. niveus*), whose two-syllabled rhythmic night-song is one of the most familiar summer noises of eastern America. This song varies greatly in pitch and rapidity according to the temperature and other conditions. In the day-time the insect trills in a different voice. Consult Howard, 'The Insect Book' (New York 1901), wherein will be found extensive references to other treaties.

Tree Ferns. See FILICALES (5), under FERNS AND FERN ALLIES.

Tree-frog, or **Tree-toad,** a frog of the family *Hylidæ,* distinguished from common frogs (*Ranidæ*) by having the ends of the fingers and toes dilated into flattened disks or suckers, which enable them to lead their peculiar arboreal life. They are of more elegant form, smaller size, brighter colors, and more active habits than the *Ranidæ,* and are lively during the day; they feed on insects, which they pursue on bushes and trees, stealing toward them or suddenly springing and swinging upon them; they climb like geckos, and by the same mechanism; the lower surface of the disks is endued with a viscid secretion, by means of which they can walk with the body suspended from the under parts of leaves and other smooth bodies; the skin is mostly smooth upon the back, but on the abdomen and inside of legs thickly studded with small warts or tubercles. They possess to a remarkable degree the faculty of changing color, by the modifications of the contents of the pigment cells under the skin (see CHROMATOPHORES) no doubt a provision to enable them to elude their numerous enemies. They are very clamorous, and particularly noisy at the approach of rain. In winter they bury themselves in the earth or in the decayed wood and dust of old stumps. They breed in the spring, depositing their eggs in the water. The species are numerous, especially in tropical America.

The common tree-frog of North America (*Hyla versicolor*) resembles a toad in form, but is more flattened; body short and warty above, the color varying from pale ash to dark brown, with several large irregular blotches of greenish brown, white and granulated below, and abdomen yellowish near the thighs; the colors vary at the will of the animal. The head is short and rounded, the mouth large, with teeth on upper jaw and vomer; eyes large and brilliant, the iris bright golden; there are 4 fingers and 5 toes, both ending in viscous pellets, the former distinct, but the latter webbed. It is about 2 inches long, and is found abundantly as far west as the Mississippi, on decaying trees and about old fences of wood or stone, the color of which it nearly resembles. It is very noisy in spring and summer toward evening, especially in cloudy weather, and its liquid and abruptly terminating note must be familiar to all residents in the country. This species in the Southern States is replaced by the green tree-frog, which is bright green above, yellowish white below, with a straw-colored lateral line extending from the upper jaw over the shoulder and along the side; it is shorter and more slender than the northern species, and is most commonly seen about broad-leaved plants, especially Indian corn, the color of the leaves of which it greatly resembles, concealed during the heat of the day, but coming out morning and evening and becoming very active and noisy; the single note is clear and bell-like. The tree-frog of Europe (*H. arborea*) much resembles this. Several other species occur in the southern and southwestern States. In the genus *Acris* the locomotive disks are less developed and the limbs more slender than in *Hyla,* and

there are teeth on the palate instead of the vomer. The *A. gryllus*, or cricket, is about 1½ inches long, with an elongated pointed head, a triangular dusky spot between the orbits; body ashy above, with a green and sometimes reddish dorsal line, and three oblong black spots margined with white on the sides. It is a lively species, constantly chirping like a cricket, even in captivity. In the genus *Hylodes* the palate is toothed, and the slender fingers and toes are free, with small disks. Pickering's tree-frog (*H. pickeringii*) is nearly an inch long, with short head and yellowish brown body, with dusky rhomboidal spots and lines, sometimes like the letter X on the back; pale flesh-colored below, tinged with yellowish on the throat. This is the true peeping frog, the noise being made by both sexes; in summer they cease to be vocal, retiring from the pools where the eggs were laid to the woods, where they live on trees, hopping about on the branches in search of insects, and occasionally uttering a shrill whistle.

Many strange variations in breeding-habits and rearing of young characterize the tree-frogs of tropical America, which exist in a great number of genera and species. A famous South American species is the ferreiro (*H. faber*), which makes small pens or nurseries under water in which its eggs are left to hatch, and where the tadpoles are confined, protected from many dangers. Another species (*H. goeldii*) carries its few large eggs on its back until they hatch, and the young remain some time afterward. The genus *Nototrema* develops pouches in the skin of the back of the female in which the eggs and young are safely transported. Extensive information and guidance to further facts may be found in the 'Cambridge Natural History,' Vol. VIII. (London 1901).

Tree-kangaroo. See DENDROLAGUS; KANGAROO.

Tree-porcupine, or **Couiy,** a South American arboreal porcupine (q.v.) of the genus *Cercolabes* (or *Sphingurus*), characterized prominently by the long, naked prehensile tail. There are several species, all small and short-spined.

Tree-rat, a small East Indian rat (*Mus arboreus*), common in Bengal. It builds a nest in cocoanut trees, and bamboos, and lives partly on grain and partly on young cocoanuts.

Tree-shrew, or **Banxring,** a small squirrel-like insectivore of India and the Malay Archipelago, the several species of which constitute the family *Tupaiidæ*. The fur is soft and glistening, and a long, bushy tail is generally present. They are restlessly active during the day, searching for insects and fruits, both on the ground and in trees. Two of the largest species are the tana (*T. tana*), with a feathery tail, in one variety of a bright, golden color; and the ferruginous banxring (*T. ferruginea*), widely distributed in the Malayan region. The soles of the feet in the latter are plaited like those of geckos, and give the animals a sure grip of a branch. Consult Blanford, 'Mammals of India' (London 1888).

Tree-sparrow. See SPARROW.

Tree-toad. See TREE-FROG.

Tree Worship. The worship of a tree as in itself divine does not appear to have prevailed in any age of the world. In the mythology of ancient Greece and Rome, trees were regarded as the abodes of sylvan deities, supernatural beings inferior to the gods of Olympus. Even where this view was not taken, and the tree was not venerated as the dwelling-place of divinity, trees were associated with the worship of the gods, and a certain degree of sanctity attached to them. This association was so strong and to the popular view so indissoluble, that to destroy a grove in which a god was worshipped was to put an end to the worship at that particular spot. Bible statements (1 Kings xv. 13, 14, and other places) show that the removal of an idol, while the grove remained, was not sufficient to put a stop to idolatry. The sacred groves were also an essential feature of Druidical worship. It should be remembered that, while the philosophers and other learned men of ancient Greece and Rome looked upon the current mythology with incredulity, if not contempt, the great mass of the people, and in particular the peasantry, were deeply devoted to it, and to them the sacred groves, the dryads, fauns and satyrs, were very real.

Tree worship, or anything resembling it, has no place in any branch of Christianity, and among Christians the attachment to trees, or any particular tree, is entirely a matter of natural sentiment. There is nothing of the kind in Mohammedanism, and the sacred literature of Buddhism attaches no sanctity to trees. Nevertheless, before the destruction, in October 1887, of the Bo tree, grown from a branch of the tree sent by Asoka, king of Maghada, and famous as a devotee of Buddhism, to Ceylon, in the 3d century B.C., thousands of pilgrims visited the tree annually and offered up prayers before it. This cannot be called tree-worship in the ancient meaning of the term. It is also true, nevertheless, that the early Buddhists regarded certain trees as sacred, and much time elapsed before members of that faith got rid of their old superstitions in this respect. Those superstitions still prevail among the more barbarous races, and some of the Greek Christians in remote districts are said to mingle pagan worship of tree-gods with their nominally Christian practices.

Trefoil, any of several plants having trifoliate leaves, as clover, etc., especially bird's-foot (q.v.), a legume of the genus *Lotus* (q.v.).

Trefoil, in heraldry, a bearing or charge representing the clover-leaf, always accompanied with its *slip* or stalk. It signifies fidelity.

Tregelles, trĕ-gĕl'ĕs, **Samuel Prideaux,** English biblical scholar: b. Falmouth 30 Jan. 1813; d. Plymouth 24 April 1875. Early in life he worked in the iron foundries at Glamorgan, and by himself studied the classical and Oriental languages. In 1837 he settled in London, where he superintended the publication of the 'Englishman's Greek Concordance to the New Testament' (1839) and the 'Hebrew and Chaldee Concordance to the Old Testament' (1843). In 1838 he began the critical study of the New Testament, and formed the design of a new Greek text derived from a comparative study of ancient manuscripts. With this end in view he made several visits to the Continent, spending five months in Rome, where he discovered some important readings in his examination of Codex B in the Vatican, which manuscript, however, he was not allowed to copy. He published

his 'Account of the Printed Text of the Greek New Testament' in 1854, and in 1857 began the publication of the first part of the Greek Testament, comprising Matthew and Mark. The remainder of the gospels and the epistles were published from time to time until 1870. The 'Revelation' was edited from his notes by S. J. Bloxidge and B. W. Newton in 1872, and in 1879 Dr. Hart published his materials for the prolegomena in an appendix to the Greek Testament. Others of his works are: 'Defense of the Authenticity of the Book of Daniel' (1852); 'Collation of the Texts of Griesbach, Scholz, Lachmann, and Tischendorf, with that in common Use' (1854); and the 'Codex Lacynthius, Fragments of Saint Luke' (1861).

Tremain, Henry Edwin, American soldier: b. New York 14 Nov. 1841. He was graduated from the College of the City of New York in 1860, served in the Union army, 1861–6, rising from the grade of private to brigadier-general of volunteers, and for conduct at the battle of Resaca, Ga., 15 May 1864, he was awarded a Congressional medal of honor. After the war he pursued the study of law and was graduated from the Columbia Law School in 1867. He was United States attorney of New York in 1873–7, and has since engaged in law practice. He is active in political matters, prominent in various military organizations of the veterans of the Civil War, and has published 'Sailor's Creek to Appomattox Court House, or the Last Hours of Sheridan's Cavalry' (1885).

Tremato'da, the flukes, a class of Platyhelminthes consistently parasitic; and yet in the simple body, the constant presence of an alimentary canal, and in some cases even of special sense-organs, they are much nearer the free-living *Turbellaria* than are the *Cestoda*, which are also of parasitic habit. The *Trematoda* include ectoparasitic forms that are less highly modified to a parasitic existence than the endoparasitic species of the group, and thus suggest the connection between the free-living and the parasitic modes of life.

In form the *Trematoda* are usually flat and leaf-like, with the mouth at the anterior tip and the excretory pore at the posterior end. An oral sucker or suckers near the mouth, and others, ventral, posterior or marginal, together rarely with chitinous hooks, form the organs of attachment. The general histology is similar to that of tapeworms (q.v.), with which the organology is also in general agreement, and only the presence of an alimentary system forms an ultimate distinction. In form this canal may be simple (rhabdocœl) or three-parted like a tuning fork (triclad). In ectoparasites, and in a few of the larger endoparasites, the canal possesses lateral diverticula which give the system a dendritic aspect. The other systems manifest evident likeness to those in the cestodes. The development of endoparasitic trematodes is complicated by alternation of generations coupled with change of hosts. In the common sheep liver-fluke, for example, the embryo (miracidium) escapes from the egg shell into water, seeks out a snail and in its tissue metamorphoses into a sac (sporocyst) in which is developed a new generation (redia). In a redia originates a similar generation or one of modified character, the cercariæ, which desert the snail and encyst on blades of grass. These are young distomes, and on reaching the stomach of a sheep are set free, wander into the liver and grow into adult flukes. Great differences in detail obtain between different species. The sheep liver-fluke (*Fasciola*, or *Distoma, hepatica*) is of great economic importance, entailing large annual losses to sheep raisers in England, Australia and the Gulf States, and producing occasional epidemics of great magnitude, with the loss in one extreme instance of $20,000,000 in a single year. Thirteen species of flukes have been reported as human parasites. The most important are the Asiatic lung-fluke (*Paragonimus westermanii*) and the human blood-fluke (*Schistosoma hæmatobium*). The former is very abundant in the East (Japan, China, Formosa) where it produces a disease superficially much like tuberculosis. It has been reported from a number of localities in the United States. The blood-fluke is peculiar in being of separate sexes instead of hermaphroditic as are almost all other trematodes. It occurs commonly in various parts of Africa and small centres are known elsewhere, though it has not gained a footing as yet in the United States. The primary effects of its parasitism are seen in the circulatory and renal systems and are often severe or even fatal. The disease produced is known as Egyptian hæmaturia.

Tremblores, a name applied to slight earthquakes, consisting of a series of rapidly recurring vibratory movements, not sufficiently powerful to create damage.

Trem'olant, an organ stop which causes the air as it proceeds to the pipes or reeds to pass through a valve having a movable top, to which a spring and weight are attached. The up-and-down movement of the top of the valve gives a vibratory movement to the air, which similarly affects the sound produced.

Trem'olite, a white or gray variety of amphibole. It occurs abundantly either in distinct crystals or in columnar or fibrous masses. It is essentially a calcium and magnesium metasilicate, being distinguished from the other varieties of the mineral by its pale color due to the absence of iron.

Trem'ulant, the name given to a draw-stop in a pipe organ, which regulates a mechanical device consisting of a thin metallic plate so arranged as to modify the admission of wind into the pipes, and by its vibrations produce a sweetly tremulous or waving effect, presumably imitative of the *vox humana*, or human voice. Young organists usually have to be warned against the overuse of this device.

Trench, Richard Chenevix, Irish prelate, archbishop of Dublin: b. Dublin 9 Sept. 1807; d. London 28 March 1886. He was educated at Harrow and Trinity College, Cambridge, where he was graduated in 1829. His college friends included Tennyson, Hallam, Maurice, Sterling, and Kemble. Ordained in 1832, he became curate at Hadleigh, in Suffolk, in the following year. He took priest's orders in 1835, and held the perpetual curacy of Curdridge, Hampshire, during 1835–41. After a few years as curate at Alverstoke, in Hants, he obtained the rectory of Itchenstoke, in the same county, in 1844. He became examining chaplain to Bishop Wilberforce of Oxford in 1845, and professor of divinity in King's College, London, the next year. The latter post was held by him till 1858, and during 1856–63 he was dean of Westminster. He

was consecrated archbishop of Dublin on the first day of 1864. He resisted the disestablishment proposals of Gladstone, but accepted the new conditions loyally. He resigned the see in 1884. He was buried in Westminster Abbey. Trench was known as a poet by many sonnets, lyrics, and other verses published in the following, among other volumes: 'The Story of Justin Martyr, and other Poems' (1835); 'Poems from Eastern Sources' (1842); 'Genoveva' (1842); 'Alma, and other Poems' (1855). His contributions to philological subjects include: 'The Study of Words' (1851); 'On the Lessons in Proverbs' (1888); 'English, Past and Present' (1855); and 'A Select Glossary of English Words' (1859). His Biblical and theological works comprise, among others, 'Notes on the Parables of our Lord' (1841); 'Exposition of the Sermon on the Mount' (1844); 'Christ the Desire of all Nations' (1846); 'Notes on the Miracles of our Lord' (1846); 'Synonyms of the New Testament' (1854); 'Studies in the Gospels' (1867); 'Brief Thoughts and Meditations' (1884); and many volumes of sermons. He was a member of the committee for revising the New Testament. Among his other publications are: 'Sacred Latin Poetry' (1849); 'The Remains of the late Mrs. Richard Trench' (1862); 'Gustavus Adolphus' (1865); 'A Household Book of English Poetry' (1868); 'Plutarch: his Life, his Lives, and his Morals' (1873); and 'Lectures on Mediæval Church History' (1877). Consult: 'Letters and Memorials of Richard Chenevix Trench' (1888).

Trench, Military. See FORTIFICATION.

Trenchard, trĕn'chard, **Stephen Decatur,** American naval officer: b. Brooklyn, N. Y., 10 July 1818; d. New York 15 Nov. 1883. He was appointed midshipman in the navy in 1834, served in the Seminole War, was on the coast survey in 1845–6, and in 1847 was promoted lieutenant. He was engaged on board the Saratoga in the war with Mexico, was attached to the coast survey in 1853–7 and in 1857–60 served on the Powhatan on her diplomatic cruise to China and Japan. He was promoted commander in 1862, participated in both attacks on Fort Fisher, and in 1866 received rank as captain. In 1871 he was promoted commodore, served on the examining board in 1871–2, and as lighthouse inspector on headquarters duty in 1873–5. He was advanced to the rank of rear-admiral in 1875 and in 1876–8 was in command of the North Atlantic squadron. He was retired in 1880.

Trenck, trĕnk, BARON **Friedrich von der,** German adventurer: b. Königsberg 16 Feb. 1726; d. Paris 25 July 1794. His life was a succession of adventures scarcely less marvelous than the romantic and highly colored account he gives of them. He entered the Prussian service in 1740 and stood high in Frederick the Great's favor, until, supposedly through his love affair with the king's sister, he incurred the royal displeasure, which caused his first imprisonment, the beginning of no end of misfortunes: loss of property, numerous imprisonments and attempts at escape, dangerous wounds, and perils of all kinds. These are all most graphically described in his 'Selbstbiographie' (1787), in a manner that reminds one of Munchausen's marvelous tales. The anecdotes interspersed give, whether true or false, a vivid picture of the turbulent condition of court life at the time of Frederick the Great and Maria Theresa, under whom Baron Trenck later served. His restless adventurous temperament led him to Paris, when the Revolution was in full swing; he was there accused of being a secret emissary of foreign powers, and was beheaded by Robespierre's order. Consult Wahrmann, 'Friedrich Freiherr von der Trencks Leben, Kerker und Tod' (1837).

His cousin, BARON FRANZ VON TRENCK, an equal hero and swashbuckler, has also written an autobiography (1748), which, however, has not attained the celebrity of the other's wonderful mixture of fact and imagination.

Trendelenburg, trĕn'dĕ-lĕn-boorg, **Friedrich Adolf,** German philosopher: b. Eutin, Germany, 30 Nov. 1802; d. Berlin 24 Jan. 1872. He studied in Kiel, where he came under the influence of John Erich von Berger, and acquired his early philosophical training at Berlin, and was appointed professor in the university of that city. His writings embrace the whole field of philosophy, ontological, ethical and esthetical. He set forth the ethical aspect of his philosophy in the treatise 'The Ethical Idea of Right and Law,' and the æsthetic aspect in 'Niobe' (1846); and 'The Cathedral of Cologne' (1853). He wrote also 'Natural Justice on the Ground of Ethics' (2d ed. 1860). His principal claim to distinction as a thinker rests on his acute criticism of the systems of Kant and Hegel.

Tren'holm, George A., American merchant: b. South Carolina 1806; d. Charleston, S. C., 10 Dec. 1876. He was one of the largest dealers in cotton in the South before the Civil War and during the war was engaged in blockade-running, endeavoring to obtain supplies for the Confederates from Nassau. He was appointed secretary of the Confederate treasury in 1864, but was taken prisoner later in that year and held until 1865 when he was pardoned by President Johnson.

Trent, William Peterfield, American man of letters: b. Richmond, Va., 10 Nov. 1862. After study at the University of Virginia and at Johns Hopkins University, he was professor of English in the University of the South (1888–1900), and dean of its academic department (1894–1900). From 1892 to 1900 he was editor of the 'Sewanee Review.' He has made a special study of Southern men and times, and has published: 'Life of William Gilmore Simms' (1892); 'English Culture in Virginia' (1889); 'Southern Statesmen of the Old Régime' (1897); and a sketch of R. E. Lee (1899). His other works include 'John Milton' (1899); 'The Authority of Criticism' (1899); 'War and Civilization' (1901); 'The Progress of the United States in the Century' (1901); 'A History of American Literature 1607–1865' (1903). He has also edited: 'Select Poems of Milton' (1895); 'Essays of Macaulay' (1897); 'Poems and Tales of Edgar Allan Poe' (1898); 'Balzac's Comédie Humaine' (1900); and (with B. W. Wells) 'Colonial Prose and Poetry' (1901).

Trent (German, TRIENT, trē-ĕnt'), Austria, a town in the southwestern part of Tyrol, situated on the river Adige or Etsch, 19 miles northeast of the Lago di Garda. It lies in a fertile valley, and has a very picturesque appearance, dominated by the ruins of a large castle. Among its numerous churches the most noteworthy are

the cathedral, built in the 13th and 14th centuries in the Byzantine style, and entirely of marble; and the church of Santa Maria Maggiore, in which the meetings of the celebrated Council were held. The principal manufactures are silk, wine, brandies, and sausages. See TRENT, COUNCIL OF. Pop. (1900) 24,868.

Trent, Canada, a river discharging into Lake Ontario through the Bay of Quinté. The greater part of its course of 150 miles consists of a series of large, irregular and elongated lakes, parts of which are navigable. The stream itself furnishes water power, and large quantities of lumber are floated down on it. It passes the towns of Peterborough and Trenton.

Trent, England, a river rising in Staffordshire, and flowing in a general northeast direction through Derby, Nottingham, and Lincoln counties, emptying into the Humber estuary near its head. It is 145 miles long, and navigable 25 miles, to Gainsborough, for vessels of 200 tons. It is connected by numerous canals with midland manufacturing cities.

Trent Affair, The, in American history, during the Civil War, in October 1861, Captain Charles Wilkes, U. S. N., intercepted at sea the British mail steamer Trent, bound from Havana to Saint Thomas, and took off two Confederate commissioners, accredited to France, Messrs. Mason and Slidell, who were among her passengers. They were taken to Boston, and imprisoned in Fort Warren, but were released on 1 Jan. 1862, on the demand of the British government, and permitted to proceed to Europe. Secretary Seward accepted England's demand as an adoption of the American doctrine which denied the right of search.

Trent, Council of, a celebrated œcumenical council of the Roman Catholic Church. It met during the pontificate of Paul III. at Trent, in the Tyrol, in 1545, and comprised 4 legates, 11 cardinals, 25 archbishops, 39 procurators of absent bishops, and 7 generals of religious orders. The wars in Germany caused its transference to Bologna in 1546, and its sittings were for a time suspended. Pope Julius III. having reassembled it at Trent in 1551 it dispersed the year following on the approach of the Lutherans under Maurice of Saxony. After eight years of interruption it was again called together by Pius IV., continued its session until 1563, and then adjourned without finishing its labors. It defined many doctrines of the Roman Catholic Church. Its decrees are embodied in what is known as the Creed of Pius IV. The council also published many reformatory decrees, instituting seminaries and causing a catechism to be drawn up. All the decrees of the council as to dogma were unanimously accepted by the Catholic states, but those relating to discipline were partially rejected, especially in France, as contrary to the usages and infringing on the liberties of the Gallican Church. The council issued its canons and decrees in Latin, and they have been often translated. The history of the council has been written by Sarpi and Pallavicino. See CATHOLIC CHURCH.

Tren'ton, Canada, a town and port of entry in Hastings County, situated on both sides of the Trent River at its mouth in the Bay of Quinté, 90 miles northeast of Toronto, and at the junction of the Grand Trunk and Central Ontario Railways. It has large manufacturing industries, and an extensive export trade in timber. Pop. (1901) 4,217.

Trenton, Mo., city, county-seat of Grundy County; on one of the forks of the Grand River, and on the Chicago, R. I. & P., and the Quincy, O. & K. C. R.R.'s; about 100 miles northeast of Kansas City and 80 miles northeast of Saint Joseph. It was established in 1841, in 1857 was incorporated as a town, and in 1893 was chartered as a city. Its limits were extended when it became a city. It is in an agricultural and stock-raising region, and nearby is a large coal field. The chief manufacturing establishments are flour mills, butter and cheese factories, cigar factories, and machine shops. In 1900 (government census) there were in Trenton 86 manufactories. The shipments are chiefly farm and dairy products, live-stock, and coal. The educational institutions are Avalon College (U. B.), founded in 1881, a public school, the Jewett Norris library, which has an endowment of $15,000. The Ruskin College (q.v.), founded in 1900, has been removed to Chicago. The two banks, national and state, have a combined capital of $150,000. Pop. (1890) 5,039; (1900) 5,396.

Trenton, N. J., city, capital of the State, county-seat of Mercer County; on the Delaware River, and on the Delaware & Raritan Canal, on the Philadelphia & Reading and the Pennsylvania R.R.'s; about 50 miles southwest of Newark and 30 miles northeast of Philadelphia. It is in lat. 40° 14′ N., lon. 74° 46′ 30″ W.

Manufacturing.— Among the large industrial establishments there are about 40 engaged in the manufacture of pottery products, including vitrified china, Belleek china, semi-porcelain, common china, and white granite; also sanitary earthenware, electrical specialties, porcelain bath tubs, vitrified and decorative tiles, terra cotta, drain-pipe, and brick. Nearly all the clay and all of the coal used in the pottery industry is brought to Trenton. The value of the products amounts to about $12,000,000 per annum. Trenton's iron industries (the great works of the John A. Roebling's Sons Company, manufacturing metal wire rope, fire-proof wire, lath, cables, etc., are here) and machine shops produce $10,000,000 per annum. There are 10 rubber works, making a great variety of products, and having sales approximating $4,000,000 each year. Other conspicuous manufactures are crackers, school and church furniture works, watches, oil cloth, carriages, and wagons. There are also anvil works, flint and spar mills, lumber yards, and fertilizer works. There are about 70 different industries, comprising over 225 concerns, representing approximately $25,000,000 capital. There are a total of 3,000 business places in the city.

Public Buildings.— The principal public buildings are the State capitol, the United States government building, municipal and county buildings, opera house, State prison, State arsenal, and the Y. M. C. A. building. The city has a large number of fine church and school buildings and business houses.

Churches and Charities.— The churches and missions in the city number about 50. There

are about 15,000 Roman Catholics, 5,000 Methodists, 3,500 Presbyterians, 4,000 Baptists and 2,000 Episcopalians. The members of the Society of Friends, Orthodox and Hicksite, once a power in the community, have dwindled to less than 100. There is a State asylum for the insane, three large hospitals, a Children's Home, the Widows and Single Women's Home, and a number of smaller benevolent and charitable institutions.

Education.— Trenton has a number of noted educational institutions, among which are the State Normal and Model schools, the State School for Deaf Mutes, an Industrial School for Girls, a large high school, about 30 public elementary and primary schools, a school of industrial arts, one Roman Catholic college, eight parish schools, one academy, business colleges, and several private schools. Educational classes are conducted under the auspices of the Young Men's Christian Association. There is a free public library, a beautiful white marble building, containing about 30,000 volumes; the State library, and several school libraries.

Banks and Finances.— There are eight banks; the combined capital of the three national banks is $1,250,000; the deposits of all except two private banks are $16,622,740. The real and personal property of Trenton is approximately $35,000,000. The cost of city maintenance each year is about $750,000. The chief items of expenditure are, for schools, $90,000; for police department, $89,000; for fire department, $61,000; for lighting, $59,500.

Government.— The administration of the city affairs is vested in the mayor, common council, and various boards. The police and fire departments are removed, by law, from political control, and are effectively administered. The water supply of the city was municipalized in 1859, and is conducted with satisfaction to the inhabitants of Trenton. The consumption of water averages about 80 gallons per capita. The board of health has taken an advanced position upon all questions of public sanitation, while the parks of the city, the main breathing ground being named Cadwalader, occupy about 150 acres. An effective system of sewer-drains and paved streets is being extended to all parts of the city, while macadamized roads lead to all nearby rural communities. A bronze statue of Washington, on a granite shaft, marks the place where Washington placed the cannon at the battle of Trenton. A monument to Gen. George B. McClellan is in Riverview Cemetery.

History.— The site of the southeastern portion of Trenton was occupied, as claimed by an influential body of scientists, as the home of man in the Ice Age. (See New Jersey.) Near the banks of the Delaware River, during the period of recorded history, was a village of the Unami sub-tribe of the Lenni Lenapé (Delaware) Indians. The name of the principal creek, Assanpink, running through the city, is a corrupted form of an Indian name meaning "place of stone implements." Many such objects are found in and near the city. The location was known to the Dutch and Swedish peltry traders, who before 1664 came to Trenton to exchange commodities with the Indians. The advent of the members of the Society of Friends at Burlington (1677) led to the development of the nearby territory. These settlers had abandoned the idea of earlier adventurers that precious metals were to be found along the Delaware, that the river was a northwest passage to China, and industriously began the work of colonization, based upon cultivation of land, and the stimulation of river commerce. As early as 1679, certain Englishmen petitioned for lands at "Ye ffalles of ye De La War," by which name the jagged rocks and accompanying rapids were known to the white men. Shortly afterward an unsuccessful settlement was attempted, the actual foundations of the city being laid, when by 1685, Mahlon Stacy built his mill near the junction of the Assanpink Creek and the Delaware River. The history of Trenton during colonial times was uneventful. Certain characteristics are notable. About 1720 the community became known as Trent's town, or Trenton, in honor of a local wealthy Scotch plantation owner, William Trent, Chief Justice of His Majesty's Supreme Court of Judicature for the Colony of New Jersey. The village was the point of contact between the East Jersey (Calvinistic) and West Jersey (Quaker) influences, so conspicuous in the early history of New Jersey, and which have left permanent impress. Located at the head of tide water, and upon one of the great highways between Philadelphia and New York, the community was closely in touch with both cities. As the shiretown of Hunterdon County, erected in 1714–15 from Burlington County, Trenton drew to itself much of the trade of the Upper Delaware as far as "The Forks," now Easton. This trade was conducted by means of canoes and "Durham boats," the latter large scows, drawing little water, built to convey grain and iron ore from the upper river to Philadelphia. In 1745, Trenton became a borough, under royal grant, her charter being surrendered in 1750. Thereafter, the village remained a part of a township of the same name until the opening of the Constitutional period. In 1758 and 1759 "barracks," standing in part and patriotically preserved, were erected for the housing of the Crown's regular and provincial troops — a step made necessary by reason of Indian outbreaks in the upper Delaware, during the French and Indian War.

The outbreak of the Revolution found sentiment in Trenton divided. Broadly, the Presbyterians were favorable to war, the Society of Friends were non-combatant, while the members of the Church of England leaned toward support of royal government. A "committee," in the village of about 600 inhabitants, was active in establishing communication between the Whigs of New York and Philadelphia, and as early as 23 May 1775 a Provincial Congress of New Jersey met in Trenton, a principal motive for assembling being the providing for militia regulation in the colony. It was near Trenton that Gen. Washington, en route to take command of the army, upon 23 June 1775, first heard the news of the battle of Bunker Hill.

Thence, until Trenton became famous as the spot where was fought one of the great, if not the greatest battle of the Revolution, the village life was without particular incident.

It was upon 8 Dec. 1776, after his memorable "retreat through the Jerseys," that Gen. Washington succeeded in conveying his little army across the Delaware at Trenton, and occupied a ferry-town, later known as Morrisville, named in honor of Robert Morris, the financier of the American Revolution. During the flight of Washington from Fort Lee to Morrisville, it was that Thomas Paine wrote the memorable words, "These are the times that try men's souls," words that later brought the then unexpected response from Lord Germain, colonial secretary of state, "All our hopes were blasted by that unhappy affair at Trenton." The fate of a nation hung in the balance. The Anglo-Hessian troops were in control of New York and quartered at Amboy and New Brunswick, and were raiding for supplies throughout East Jersey. Rall, the Hessian commander, occupied Trenton, with outposts stretched for 20 miles north and south of the city. Philadelphia was threatened, and the Whigs in that city were almost panic-stricken. Washington wrote, "No man, I believe, ever had a greater choice of difficulties and less means to extricate himself from them." Congress, charging Washington with dictatorial powers, fled from Philadelphia to Baltimore, while Eastern Pennsylvania and much of New Jersey were overrun with Tory sympathizers and a riff-raff ready to follow the flag that was in the ascendency. Disappointed in not meeting Gen. Lee, and chagrined at his capture, Washington disposed his force of 10,000 men along the west bank of the Delaware. Four brigades, under Gens. Stirling, Mercer, Stephen, and DeFennoy held the river fords from New Hope to Yardley; Gen. Ewing occupied Morrisville, opposite Trenton, and Col. Cadwalader held Bristol, 10 miles below. Taking advantage of the fact that the Hessians would celebrate Christmas with feasting and drinking, Washington prepared to rid West Jersey and Philadelphia of all danger from Anglo-Hessian occupancy. Cadwalader was to cross at Bristol and drive the king's troops from Burlington County, Ewing was to take position south of Trenton, holding Rall's men in check, while Washington was to cross the river nine miles above Trenton, and by a sudden descent capture or destroy the Hessian garrison in the village. Only one part of the plan was made effective. With 2,400 men and 18 pieces of artillery, Washington crossed the river, in a northeast storm, upon the early morning of December 26. Advancing quietly along the road from a point now known as Washington's Crossing, then called McConkey's Ferry, Gen. Washington led his men through sleet and snow and over frozen ground to a point where the highway forked. The army separated about four miles from the village, one division being commanded by Washington, the other by Gen. Sullivan. Both divisions reached Trenton shortly after sunrise. Immediately confusion seized the Rall, Von Lossburg, and Von Knyphausen regiments there quartered. Their pickets were driven back, and the battery of Capt. Alexander Hamilton, stationed near the present Battle Monument, swept one of the three principal streets of the town. Rall was wounded unto death, and finding themselves caught in a cul-de-sac, the regimental commanders surrendered at various points in the village. No American officer or enlisted man was killed, and only four were wounded. The Anglo-Hessian loss was about 20 killed and 75 wounded. Nine hundred and eighteen men were captured by Washington, who, during the same day recrossed the river, with 1,000 of his own men reported unfit for duty. While the battle of Trenton was being fought, neither Ewing at Morrisville nor Cadwalader at Bristol was able to co-operate with Washington, owing to the river being filled with ice floes.

Two causes may be said to have operated to secure the defeat of Col. Rall. One was the ill-feeling undoubtedly existing between the Hessians and the English, and the consequent lack of discipline. Rall, who had early been warned of Washington's preparations, was drunk upon the night previous to the battle and neglected all customary preparations to meet a foe for whom he had contempt. Washington immediately took advantage of the electrical effect that the battle produced. He recrossed the river from Pennsylvania and upon 2 Jan. 1777 occupied Trenton, with strong outposts established nearby at the villages of Bordentown and Crosswicks. The British generals, Cornwallis and Grant, with 8,000 Anglo-Hessian troops, advanced toward Trenton from New Brunswick, 30 miles distant; fighting their way inch by inch. Through the centre of Trenton passes the Assanpink Creek, then well wooded and surrounded by marshy soil. Washington crossed to the south side of the stream, occupied rising ground, leaving the main part of Trenton to the king's troops. Determining to capture the British stores at New Brunswick, strike a blow at Col. Charles Mawhood's regiments at Princeton, and in a month regain partial control of "the Jerseys," over which he had been pursued, Washington escaped from Trenton at midnight 3 January. Leaving his camp fires brightly burning, he marched to the eastward of Trenton and early in the morning fell upon Mawhood at Princeton, defeated him, and made away for winter quarters at Morristown. At the battle of Princeton, Gen. Hugh Mercer, for whom Mercer County is named, was brutally stabbed and soon died. During the remainder of the Revolution Trenton was an important centre. To the village were brought spoils captured by the Whigs, and during the British retreat from Philadelphia to Monmouth an attempt was made to divert a body of Anglo-Hessian troops for the purpose of raiding the town. Here met the Committee of Congress that attempted to dispose of the question of the Pennsylvania-Connecticut land grants, which at the close of the Revolution so seriously affected the rights of the settlers in the Wyoming Valley. In 1782, 153 inhabitants of Trenton formed an association to prevent the importation of British goods, and bring all sellers and purchasers to a realization of the dominant Whig spirit.

This action was taken to meet a trade-policy begun by British merchants, when it was found that for the purpose of conquering the United States the War was a failure. In June 1783 the Congress of the Confederation, torn by internal dissensions and State prejudices, a wandering body, abused, threatened, and insulted, undertook the establishment of a Federal capital, requesting various States to yield to the United States jurisdiction over any district to the extent of 20 miles square and to grant £30,000 in specie for purchase of lands and erection of Federal buildings. Trenton being suggested as a suitable location, a contest between the South and New England was precipitated. A compromise was effected to the end that Congress should meet alternately in Trenton and Annapolis, a plan described by Francis Hopkinson as a new mechanism in government, of a pendulum-like character. Congress met in Annapolis, and a patriotic Trentonian who died in December 1783, made a bequest of £100 to Congress if that body would settle itself at Lamberton, now the southern part of the city. On 1 Nov. 1784 Congress met in Trenton, and an ordinance was passed to lay out a Federal city upon either bank of the river and to provide suitable buildings at a cost of not over $100,000. Congress adjourned to New York, where it met 11 Jan. 1785. Ultimately in the autumn of 1785 the South defeated the appropriation measure, and thus died the plan to make Trenton the capital of the United States.

Before the close of the 18th century, Trenton accorded a reception to President Washington upon 21 April 1789, while he was on his way to New York to attend his, the first, inauguration. A triumphal arch was erected over the Assanpink bridge, while maids and matrons strewed his way with flowers. The Federal government was conducted at Trenton during a smallpox epidemic in Philadelphia immediately before the removal of the public offices to Washington. Upon 25 Nov. 1790, Trenton, after a long contest between East and West Jersey, was chosen, as a compromise, to be the capital of the State, and two years later received a charter as a city, with only minor officers authorized to be selected by a limited electorate. This class legislation, characteristic of the conservative spirit of early State legislation, lasted until the adoption of a State Constitution in 1844.

The year 1804 was notable in the history of Trenton for the opening of a bridge across the Delaware River, making an all land stage route from Jersey City to Philadelphia, and the chartering of the Trenton Banking Company, which, with a bank at Newark, organized the same year, were the first in the State. By 1830 Trenton contained about 5,000 inhabitants. With agitation concerning the development of water power, the improvement of highways, the construction of the Delaware and Raritan Canal, and the building of lines of railway to unite New York and Philadelphia, the city entered upon an industrial life. Within 10 years, Trenton had direct communication by land and water with all of the growing cities of the Atlantic seaboard, and her manufactures commanded national attention. Before 1860, her potteries and her metal industries had become well established, although both traced their origin, by sporadic development, to Revolutionary times. Later came the third of Trenton's great industries, that of the rubber goods manufacture. The later history of Trenton is largely the record of commercial development, and of steady growth.

Prospective Growth.— Owing to advantageous location upon the lines of great railway systems, its position at the head of tidal navigation, and the slight resistance offered by geological conditions, Trenton is destined to advance rapidly as an industrial centre. The growth of the city is purely normal, the city itself meeting all reasonable demands made by the congesting tendencies of population. An extensive system of trolley lines, one of which unites Philadelphia and New York, has given Trenton a distinctive impulse.

Pop. (1880) 29,910; (1890) 57,458; (1900) 73,307; (1904) est. 80,000. In 1900 the city contained 16,793 persons of foreign birth.

FRANCIS B. LEE,
Editor 'New Jersey as a Colony and as a State.'

Trenton, Tenn., city, county-seat of Gibson County; on the Mobile & Ohio railroad; about 82 miles northeast of Memphis. It is in a fertile agricultural region in which an excellent quality of cotton is grown. The chief manufacturing establishments are cottonseed-oil mills, cotton compress, a large cotton mill, box factory, flour mills, and foundries. The educational institutions are the Peabody High School, Laneview Academy, graded elementary schools, and a library. The two banks (State) have a combined capital of $85,000. Pop. (1890) 1,693; (1900) 2,328.

Trenton Falls, a series of six beautiful cascades in West Canada Creek, Oneida County, New York; 15 miles north of Utica. The cascades appear at intervals as the creek passes through a ravine two miles long. The total descent, in the two miles, is 312 feet.

Trenton Stage, that interval of geologic time during which the Trenton strata of New York and Canada and the equivalent beds of other regions were laid down. Trenton strata are typically developed in the Mohawk Valley in New York State, the type locality being Trenton Falls on the South Canada Creek near Utica. The beds are typically limestones of a dark color and often argillaceous. They are very fossiliferous, among the common species being: *Rafinesquina alternata, Plectambasites sericea, Dalmanella testudinaria, Prasopora tycopordon, Calymmemrenaria, Trinucleus concentricus, Araphus gigas,* and many others. The formation is well developed in the valley of Lake Champlain, and in the Upper Saint Lawrence Valley. In southern and central New York the formation is buried by several thousand feet of later strata. Where thus buried it is often a reservoir of gas or even oil. In the Upper Mississippi region it is represented by the Galena limestone. On the Cincinnati anticline it underlies the typical Cincinnati beds. In the Hudson Valley it is in part represented by shales carrying a graptolite fauna with *Dicellograptus, Cocnograptus,* and other types. In age the formation is Middle Ordovician. See PALÆOZOIC; ORDOVICIAN; CINCINNATI ANTICLINE, etc.

Trepang', in zoology, a popular name for several edible tropical holothurians (q.v.), especially *H. edulis* of the Oriental seas. It reaches two feet in length and forms an important article of food in China, called by the French *bêche de mer*. About 35 varieties are enumerated by traders, but only five or six have any real commercial value. To prepare them for the market the viscera are removed, and the animals boiled for about 20 minutes, then soaked in fresh water, and afterward smoked and dried. The curing process occupies about four days, during which the trepang must be kept very dry, for it readily absorbs moisture from the atmosphere. The final product is an uninviting rubber-like substance, which is used to prepare a thick soup, much liked in China and the Philippine Islands. Trepang is largely prepared by the Chinese in Hawaii and California from local holothurians, both for local consumption and for export to China. Consult Simmonds, 'Commercial Products of the Sea,' and similar books.

Trephine, trĕ-fēn' or trĕ-fīn', a surgical instrument consisting of a cylindrical or crown saw about one half to one inch in diameter, with a cross handle like that of a gimlet, and a centre-pin which, when the instrument is used, is thrust forward a little beyond the level of the teeth of the saw so as to secure accurate implantation and prevent sliding. It resembles in some respects the trepan, and both are used to remove a circular disk or button of bone from the skull. This operation is known as trephining or trepanning, and is resorted to for the purpose of relieving the brain from pressure or irritation. It has been employed in simple fractures with signs of compression; in compound fractures with depression and apparently no compression; in punctured and gunshot fractures, even without symptoms; in coma, from meningeal abscess, hemorrhage, and tumors; and in epilepsy and insanity, where lesions could be definitely localized.

Tre'r Ceiri, trār chā'rī, the ruins of an ancient British fortified town situated in the northwestern part of Wales, six miles south of Carnarvon. The surrounding fortifications and substantial stone walls of the Cytian-houses or huts are still standing. An investigation in 1903 disclosed a number of Celtic bronze and iron implements and ornaments, specimens of Celtic pottery, and porcelain beads of Egyptian manufacture, which place the date of the fort at about the 2d century A.D.

Trescot, trĕs'kŏt, William Henry, American diplomat: b. Charleston, S. C., 10 Nov. 1822; d. Pendleton, S. C., 4 May 1898. He was graduated from the College of Charleston in 1840, studied at Harvard, and was admitted to the bar in 1843. He was secretary to the United States legation at London in 1852–3, assistant secretary of state for South Carolina in 1857–60, resigning upon the secession of that State. In 1862–6 he served in the State legislature and after the close of the war was sent to Washington as the representative of his State during the Reconstruction period. He removed to Washington in 1875 and engaged in law practice there. He was appointed counsel for the United States before the fishery commission at Halifax, N. S., in 1877, was one of the commissioners to revise the treaty with China in 1880, represented the United States in reference to her rights on the Isthmus of Panama in 1881, and in 1882 was commissioner with General Grant to conclude a commercial treaty with Mexico. He was subsequently engaged in the practice of law at Washington. He published: 'A Few Thoughts on the Foreign Policy of the United States' (1849); 'An American View of the Eastern Question' (1854); 'The Diplomatic History of the Administrations of Washington and Adams' (1857); etc.

Tres'pass is a legal term applied generally to any offense against the person or property of another, but more especially applied to peaceable, but unlawful entry upon another's property for which there is a remedy by action, for damages. Any person entering the house or grounds of another may be expelled by force, if such is necessary, but trespass is justifiable where the intrusion is for a lawful purpose — as to pay or demand money lawfully due, or to serve any legal process, and forcible entry may be made to execute a criminal process. One who aids and abets the perpetration of a trespass is liable with the one committing same. A trespass is deemed wilful when the trespasser has received notice not to intrude, and it is malicious, where the intrusion is designed for the purpose of injury, or annoyance. One in possession of real estate can generally maintain an action against one trespassing against his rights, and such possession can be either in person or by tenant. Trespass may be committed on a highway or road by one who has the use of same against the owner of property adjoining it, and against one who may unlawfully obstruct such highway or road. Any unlawful interference with another's goods or property is trespass, it not being necessary to take actual possession of the same; the taking of one's goods or property by accident, or error, constitutes trespass, unless in the event of some justifiable cause. In many of the jurisdictions there exists by statute, criminal actions for trespass, where the same is wanton or malicious. A trespasser is responsible for the natural consequences of his wrongful or negligent act, but where no special injury is shown, only nominal damages, as a rule, can be recovered. Poaching is a non-legal term applied to trespassing on the property of another for the purposes of killing and stealing game or fish.

Trevelyan, trĕ-vĕl'yan, Sir **Charles Edward**, English statesman: b. Taunton, Somerset, 2 April 1807; d. London 19 June 1886. He was educated at the Charterhouse and Haileybury College, and entered the East India Company's Bengal civil service in 1826. He returned to England in 1838 and in 1840 was appointed assistant secretary of the treasury. He was knighted in 1848 for his services during the Irish famine, and later, with Sir Stafford Northcote and others, was instrumental in throwing open the civil service to competition. In 1859 he was appointed governor of Madras, but was recalled in 1860 for having protested against a new system of taxation imposed in India. He became finance minister in India in 1862, and during his administration introduced various fiscal reforms and also promoted the extension of public works. He resigned because of failing health in 1865, and after his return to England engaged in numerous charitable enterprises. He was created a baronet in 1874. He wrote: 'Edu-

cation of the People of Ireland' (1838); 'The Purchase System in the British Army' (1867); 'Christianity and Hinduism Contrasted' (1882); etc.

Trevelyan, Sir George Otto, English biographer, historian, and politician: b. Rothley Temple, Leicestershire, 20 July 1838. He was educated at Harrow and Trinity College, Cambridge, was for several years in the Indian Civil Service, sat in the House of Commons in 1865–8 as the representative of Tynemouth in the Liberal interest, and in 1868 was returned by the Hawick or Border Burghs. He was appointed a civil lord of the admiralty in Gladstone's administration of 1868, but resigned in 1870 because he disagreed with his colleagues on the Elementary Education Bill. He was prominently identified with the movement for the abolition of the purchase of army commissions, and he was a leading advocate of the electoral reforms effected in 1884–5. In 1880 he accepted the post of parliamentary secretary to the admiralty, and in 1882, after the murder of Lord Frederick Cavendish and Mr. Burke, he went to Ireland as chief secretary to the lord-lieutenant. In 1884 he entered the cabinet as chancellor of the Duchy of Lancaster, and on the formation of Gladstone's short-lived ministry in 1886 he accepted office as secretary of state for Scotland. He resigned less than two months later because he could not support the Home Rule policy of the ministry, and in June of the same year succeeded to the baronetcy. He failed to secure re-election as a Unionist after the dissolution of 1886, but in 1887 he was returned as a Gladstonian Liberal for the Bridgeton division of Glasgow, a constituency which he represented continuously from that date till his retirement from political life early in 1897. In the Liberal government of 1892–5 he was secretary for Scotland. He is favorably known as an author by the following works: 'The Competition Wallah' (1864), a series of letters on Indian matters reprinted from 'Macmillan's Magazine'; 'Cawnpore' (1865); 'The Ladies in Parliament, Horace at the University of Athens, and other Pieces' (1868); 'Speeches on Army Reform' (1870); 'The Life and Letters of Lord Macaulay' (1876), an admirable biography of his uncle; 'The Early History of Charles James Fox' (1880), still unfinished; and 'The American Revolution,' part i., 1766–1776 (1899), a strongly panegyrical work, containing many interesting side-lights on the statesmen and soldiers of the period.

Treves, trēvz, **Sir Frederick,** English surgeon: b. Dorchester 15 Feb. 1853. He was educated at the Merchant Taylors' School, and in 1881–6 was professor of anatomy and pathology in the Royal College of Surgeons. He was examiner in surgery at Cambridge University, and during the Boer war accompanied General Forbes to South Africa as consulting surgeon, and was with the relief column at Ladysmith. He held the post of surgeon extraordinary to Queen Victoria, 1900–1; and performed the operation for appendicitis on King Edward VII. 24 June 1902. He was created baron during the coronation season. He is the author of works on physical education, surgery, and anatomy, and has also published a 'Tale of a Field Hospital' (1900).

Treves, trēvz (Fr. trāv; Ger. **Trier,** trēr), Prussia, a town of the Rhine province, situated on the Moselle, six miles from the boundary of Luxemburg, and 25 miles northeast of the city of Luxemburg. Outside of southern France no city of Europe north of the Alps contains so many and so well preserved remains from the Roman period as Treves. There are a large amphitheatre built by Trajan, an old Roman gate, the "Black Gate," large and magnificent Roman baths in one of the suburbs, the picturesque ruins of a palace of the Roman emperors, an old church, originally a Roman administrative building, and several other Roman buildings in the surroundings of the city. Portions of the cathedral and the foundations of the bridge across the Moselle are also Roman. The cathedral guards the Holy Mantle, believed to be the shroud in which Christ's body was wrapped. The provincial museum also has a rich collection of antiquities. The industries are very varied, the most important being iron foundry, tanning, dyeing, and joinery. In the neighborhood are lead and copper mines and gypsum quarries. Treves is one of the most ancient towns of central Europe. It was originally the capital of a Gallic tribe called Treviri. During the 4th century it was often the residence of the Roman emperors, and later it became the seat of the powerful archbishops of Treves, who had temporal sway over a considerable territory. Pop. (1900) 43,506.

Trevil'ian Raid and Battle of Trevilian Station. On 5 June 1864 Gen. Grant ordered Gen. Sheridan to take two divisions of cavalry and move on Charlottesville, destroy the railroad bridge over the Rivanna near that town, the Central Railroad from that point to Hanover Junction, if practicable, and then rejoin the army. To Gen. Hunter, whom it was expected he would meet at Charlottesville, Sheridan carried instructions to unite with him and join the Army of the Potomac. Sheridan started on the morning of the 7th with Torbert's and Gregg's divisions and four batteries of artillery, in all about 8,000 men. He crossed the Pamunkey at New Castle Ferry, moved up the north bank of the North Anna, marching by way of Aylett's and Chilesburg, crossed both branches of the North Anna on the 10th, and at night encamped a little over three miles northeast of Trevilian Station, on the Central Railroad. He had heard the day before that Gen. Breckinridge, with an infantry division, was moving up the railroad to Gordonsville, and that the Confederate cavalry was marching in the same direction on the south side of the North Anna to intercept his own column, and during the night it was ascertained that it was in his front. Gen. Lee had heard on the morning of the 8th that Sheridan was on the march, and ordered Gen. Wade Hampton, with his own division of cavalry, to follow in the direction of Gordonsville, directing Gen. Fitzhugh Lee, with another division to follow Hampton as speedily as possible. Hampton had in the two divisions, about 5,000 men and three batteries of artillery. On the morning of the 9th Hampton marched from Atlee's Station of the Virginia Central Railroad toward Beaver Dam Station, passed Louisa Court House on the 10th, and encamped that night in Green Spring Valley, three miles northwest of Trevilian Station; Fitzhugh Lee near Louisa Court House, about six miles east of the station. During the night Hampton learned where Sheridan had encamped

and determined to attack him at Clayton's store, about midway between Trevilian Station and Carpenter's Ford of the North Anna. His own division was to advance by way of the station; Fitzhugh Lee by the direct road from Louisa Court House to the store. Hampton started early, and by daylight had reached the station and was moving on the road to Clayton's store, with Butler's and Young's brigades, Rosser's brigade advancing by a road on his left, when Sheridan was encountered, having scarcely left his camp, Torbert's division in advance, and about three miles from the station. There was a sharp skirmish between the advance parties, and Hampton dismounted his men and formed them in dense timber across the road. Gen. Custer, with his brigade, was sent by a wood road on the left to strike the Louisa Court House road and move up in Hampton's rear, passed unnoticed and unopposed to his assigned position, captured many of the Confederate led horses, and created much confusion. Sheridan says that as soon as he heard of this the two remaining brigades of Torbert's division were dismounted, assaulted Hampton's position, and carried it, though with severe loss, capturing many prisoners and driving Hampton's men at a run back on Custer at Trevilian Station, some of them through Custer's line, and that Custer began fighting in all directions, capturing many of the enemy. Hampton, however, says he was not driven from position, but that, finding Custer in his rear, he withdrew to a new position, and that Rosser punished Custer severely, driving him back against Fitzhugh Lee, who was coming up, recapturing some ambulances, wagons, and three caissons, and taking in addition four caissons and Custer's headquarters wagon. Gen. Gregg attacked Fitzhugh Lee on the Louisa Court House road, drove him, and pursued until night. Hampton's division fell back in the direction of Gordonsville and, during the night was joined by Fitzhugh Lee, who made a detour for that purpose. Sheridan encamped at Trevilian Station. At night Sheridan learned from some of his 500 prisoners that Hunter was moving on Lynchburg and that Breckinridge was at Gordonsville. He therefore determined to return, as his ammunition had been much reduced. On the morning of the 12th Gregg's division began the destruction of the railroad toward Louisa Court House, and at 3 P.M. Torbert's division, reinforced by a brigade of Gregg's, went up the Gordonsville road to secure a by-road leading over Mallory's Ford of the North Anna, as Sheridan intended to return by way of Spottsylvania Court House. Torbert became heavily engaged with Hampton, the battle continuing until 10 P.M., the advantage remaining with Hampton. During the night Sheridan moved back by the route he had come, recrossing the North Anna at Carpenter's Ford, abandoning some of his very severely wounded, but carrying 377 with him, in conveyances of every description, and some 370 prisoners. He reached the White House on the Pamunkey on the 21st, followed by Hampton, who moved on the south side of the North Anna. Sheridan's loss at Trevilian Station on the 11th and 12th was 102 killed, 470 wounded, and 435 captured or missing. Hampton says he captured 570 prisoners in the battle and in pursuit, and that the loss in his own division was 59 killed, 258 wounded, and 295 missing, a total of 612. The loss in Lee's division is not given. Sheridan marched from White House on the 22d, had a severe engagement with Hampton at Saint Mary's Church (q.v.) on the 24th, and on the 25th and 26th crossed the James River near Bermuda Hundred and rejoined Gen. Grant. His entire loss, June 7–24, was 150 killed, 738 wounded, and 624 captured or missing. Consult: 'Official Records,' Vol. XXXVI.; Humphreys, 'The Virginia Campaign of 1864–5'; Sheridan, 'Personal Memoirs,' Vol. II.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Trevisa, trĕ-vē'sa, **John**, English writer and translator: b. Cornwall about the middle of the 14th century; d. 1412. He was educated at Queen's College, Oxford, where he was an associate of Wyclif's, and on taking holy orders was appointed vicar of Berkeley, in Gloucestershire, and canon of the collegiate church of Westbury. His chief works are a translation of Higden's 'Polychronicon' (1837), one of the earliest specimens of English prose; of Occam's 'Dialogue between a Soldier and a Clerk,' and of 'Bartholomæus de Proprietatibus Rerum,' which last, a very mine of rare English words, stands in the list of proposed reprints of the Early English Text Society. Caxton said that Trevisa had also translated the Bible; but his version, if it ever existed, is not known to be extant.

Treviso, trā-vē'sō, Italy, the capital of the province of Treviso in Venetia, situated 16 miles north of Venice. Among its interesting buildings are the cathedral of San Pietro, begun in the 12th century and but recently finished, the large Gothic church of San Nicolò (1310–52), the recently restored provincial palace, a new and fine court-house, and the theatre. The manufactures include hardware, machinery, paper, silk, and pottery; and there is a lively trade in grain and cattle. Pop. (1901) 33,987.

Trevithick, trĕv'ĭ-thĭk, **Richard**, English engineer and inventor: b. Illogan, Cornwall, 13 April 1771; d. Dartford, Kent, 22 April 1833. In 1797 he succeeded his father as a leading engineer in Cornish mining. Among his first inventions was an improved pump, which soon came into universal use in deep mining. He next perfected a high-pressure steam-engine, and began to experiment in the construction of locomotive engines. Passengers were first conveyed by steam by means of his road locomotive in 1801, and he soon after successfully worked a tram-road locomotive. His ideas were afterward taken up and developed by Stephenson. He was the first to recognize the value of iron in shipbuilding, and the application of steam to agriculture. In 1816 he went to Peru, where several engines of his devising were in use in the mines, but the outbreak of the war of independence ten years later caused him to lose all his property there. After some adventures in Central America, where he met Robert Stephenson, he returned to England in 1827. His request for recognition and reward for his numerous inventions was disregarded by government, and during his latter years he was in great poverty. Consult the biography by his son Francis (1872).

Trevor, trē'vôr, **Sir John**, English statesman: b. 1626; d. London 28 May 1672. He entered Parliament in 1646, but attained to no important position until 1659, when he became a member of Monk's council of state. Early in

the reign of Charles II., however, he obtained some public employment in France, and in 1668 was again sent there, this time as a special envoy to negotiate a treaty. On his return to England he was knighted, and shortly afterward was appointed a secretary of state. He was reputed to hold non-conformist opinions, yet his position in the government required him to inquire into and to suppress, where necessary, sectarian meetings in parts of the kingdom. In 1671 he was named on the committee to investigate the petition of Irish landholders dispossessed by Cromwell.

Tri'ad, Hindu. See TRIMURTI.

Triangle, a plane figure bounded by three right lines; a portion of a spherical surface cut out by three planes which meet at the centre of the sphere. It is found convenient to restrict the name spherical triangle to figures whose sides are each less than a semicircle of the sphere. See TRIGONOMETRY.

Triangle of Forces. See MECHANICS.

Triangula'tion. See SURVEYING; GEODESY.

Trianons, trē a nôn', **The,** Versailles, France. See GRAND TRIANON; PETIT TRIANON.

Trias'sic Period, that space of time regarded by geologists and palæontologists as lying between the close of the Carboniferous Era and the beginning of the Jurassic period of Mesozoic time. Triassic rocks are thus at the base of the Mesozoic system, and have been called in Great Britain the New Red Sandstone. Its limits, however, are rather confused, and in the United States the rocks of this period are hardly separable from those of the Jurassic, so that they are known to American palæontologists as "Juratrias." They are represented by various formations along the northern Atlantic coast; and in this age were erupted the trap overflows whose remains are the Palisades of the Hudson, East and West Rocks, at New Haven, and other similar outcrops in Connecticut. In the interior, the red beds in the foot-hills of the Rocky Mountains belong here; and there are extensive Juratrias formations on the Pacific. Triassic strata are known over large areas in various parts of the Old World; and in all countries yield some of the best building stones and grits.

The life of the period is not greatly different from that of the Carboniferous, especially in the vegetation, as cycads, tree-firs, etc., remained prominent. (See PALÆOBOTANY.) Fishes abounded. The dipnoans came nearly to an end, and sharks and certain higher orders began to prevail. Reptiles multiplied on land, and marine forms began to develop, such as mosasaurs, plesiosaurs and their relatives in all parts of the world. The most important and characteristic creatures of the time, however, were amphibians, especially of the Stegocephalian type. Compare Jurassic. See GEOLOGY, and the authorities there cited.

Trias'sic System, the lowest division of the Mesozoic or secondary strata, so named from its three-fold division in Germany, as follows: Transition or Rhætic, Upper Trias or Keuper, Middle Trias or Muschelkalk, Lower Trias or Bemter Sandstein. Of these divisions, the middle one alone is marine, and characterized by marine fossils (*Ceratites nodosus, Encrinus liliiformis, etc.*). The Keuper consists of non-marine sandstones, marls and clays, often with coal seams. The Bemter consists of mottled red and green sandstones, marls, and conglomerates with occasional beds of dolomite, rock salt, and gypsum. The typical marine Triassic series of beds is found in the Alps, Himalayas, and Siberia. The following subdivision has been made (J. P. Smith):

Bajuvarian	Rhætic	Dinarian	Anisic
	Juvavic		Hydaspic
Tivolian	Karnic	Scythian	Jakutic
	Noric		Brahminic

The basal member is shown in the Himalaya region. In various portions of California and other western States sections are obtained which cover each a greater or smaller interval of the entire Triassic column. Altogether the entire interval is pretty well covered by the various local sections, so that western North America furnishes a nearly complete series of marine Triassic strata. In other regions of North America the Triassic strata are chiefly non-marine. Such is the condition in the interior, and such is the character of the Newark system of eastern North America (Nova Scotia, Connecticut Valley, New York, New Jersey, and Pennsylvania to Virginia region, and the isolated patches in Virginia and the Carolinas). In Europe the Triassic is often called the "New Red" sandstone, in distinction from the "Old Red" sandstone or Devonic system. This name is little used in the United States. See NEWARK SERIES; NEW RED SANDSTONE; TRIASSIC PERIOD.

Tribe, a word of various meanings, but generally signifying an aggregation of families of similar descent, united under a common leadership, and forming part of a nation, as in the case of the Roman tribes, or a nation in itself, as the Sioux or the Cherokee nation of Indians. The tribe was undoubtedly the first step in social organization from the independent family — the human male and female living with their offspring apart from others of their kind, in cave or woods. The tribe was retained in political organizations even of an advanced stage, such as Athens and Rome. It was and is to this day the only form of organization among uncivilized races, and it is retained, stripped, however, of political significance, by some of the civilized, such as the Highlanders of Scotland. The tribal system, while in itself a signal advance from the independent family, has generally been found an obstacle to social and political progress when brought into contact and rivalry with higher political development. The progress of Scotland was undoubtedly retarded by the tribal or clan system among the Highlanders, and has been wonderfully rapid since the clans were virtually suppressed as political entities by the British government in the 18th century. The internal history of Russia has been largely a struggle of imperial and centralizing against tribal influences. The Indian tribes of America are slowly but surely becoming merged in the general population.

Tribune, the designation of certain Roman officials, civil and military, with varying rank and power. The title is plainly derived from the tribes which the tribunes represented, and the early tribunes were no doubt commanders of the horse and foot furnished to the Roman army by the original tribes. The number of these military tribunes was increased with the number of the tribes; the kings, it is assumed, appoint-

ing them while the monarchy lasted, and the consuls succeeding to that power. As the division between patricians and plebeians grew wider, the popular assembly became jealous of the consuls, and demanded and obtained a voice in the appointment of military tribunes, the tribunes nominated by the popular body ranking as magistrates of the Roman people, as well as military officers. One of the tribunes, known as the *tribunus ærarius,* was the paymaster of the troops.

Far superior to the military tribunes, and armed with a power of veto which made them superior even to the consuls, when it came to an issue of authority, were the "tribunes of the commons," created as the result of a long struggle between patricians and plebeians. In 494 B.C. the commons seceded, and took refuge on the Sacred Mount, and bound themselves to stand by each other until the patricians should consent to the appointment of two officers to protect the plebeians in their rights. The patricians agreed to the demand, and the tribunes of the people, who figured so prominently in the subsequent history of Rome, were created. Their powers increased enormously in the later years of the republic, and were ultimately absorbed by the emperors. See ROME.

Tricer'atops, a gigantic armored dinosaur found fossil in the Upper Cretaceous rocks of Wyoming. It was larger than a modern rhinoceros, and had three great horns upon the skull. See DINOSAURIA.

Trichi'asis, an inversion of hairs about an orifice of the body, especially of the eyelashes. The inverted lashes irritate the ball of the eye, and may cause ulceration and opacity of the cornea. The chief cause of this distortion is trachoma, accompanied by faulty cicatrization of the lids and their conjunctival membrane. The affection may also be caused by injuries and blepharitis, or be associated with eutropion. Treatment consists in removal of the offending eyelashes and, when necessary, operative measures to correct the faulty position of the lids. The term trichiasis is also applied to hair-like filaments in the urine, the result of disease of the kidneys or bladder; to a matting and interlacing of hair (*Trichiasis coacta*); and to knotty swellings in the female breasts (*Trichiasis lactea*), from an accumulation and arrest of milk in the milk-ducts.

Trichi'na, Trichini'asis, a parasite and the disease resulting from its presence in the human body. The parasite is a nematode worm (see NEMATODA), *Trichina spiralis,* which inhabits the muscles, usually of the pig, and may be transferred to the human system by eating infected pork raw or insufficiently cooked. The worm, in its imperfect condition, inhabits the muscles of the pig (and of various other animals, especially rabbits, rats, and the like), each worm being coiled up within a little cyst, or envelope, which may become calcareous. In this state it is incapable of further change, but if the flesh of the pig be eaten, say by man, the worms become liberated from these cysts by the digestion of the meat, develop sexual organs, and produce enormous numbers of young within the human alimentary canal in a very short space of time. These young worms bore their way through the intestinal walls to find a resting-place among the muscles, where they become encysted like their parents. The irritation consequent on this migration is very great, and constitutes the disease trichiniasis.

The preliminary symptoms are loss of appetite, prostration, and general debility, which continue for about a week. Pains of a rheumatic character, dropsy and swelling of the limbs, along with fever, next occur, indicating the progress of the trichinæ brood from the digestive system to the muscles. This stage of trichiniasis is unquestionably the most dangerous. Severe pains are experienced and even breathing may be executed with difficulty, owing to the lesions of the muscles. Diarrhœa is also prevalent, the symptoms on the whole bearing a resemblance to those of gastric fever. In about four weeks after the commencement of the symptoms, the disease usually begins to abate, but severe cases may terminate fatally. Epidemics of trichiniasis have chiefly occurred on the European continent, where the habit of eating smoked and uncooked sausages is widespread. A temperature of 167° F. is sufficient to kill trichinæ larvæ. The treatment of trichiniasis appears to consist in active purgation in the early stages of the disease, in order to force the worms from the intestine. See PARASITES.

Trichinopoli, trĭch-ĭn-ŏp'ō-lĭ, **Trichinopoly,** or **Tiruchinapalli,** India, a town in the province of Madras, situated at a railroad junction 190 miles southwest of Madras, on the right bank of the Kaveri River. It is defended by a fortress built on a steep rock, 500 feet high. The rock is crowned by a large pagoda, and another temple carved out of one side of it. The town manufactures cutlery, saddlery and jewelry. Pop. (1901) 104,726.

Trichromat'ic Process. See THREE-COLOR PROCESS.

Triclin'ium, among the Romans the dining-room where guests were received, furnished with three couches, which occupied three sides of the dinner table, the fourth side being left open for the free ingress and egress of servants. On these couches, which also received the name of triclinium, the guests reclined at dinner or supper. Each couch usually accommodated three persons.

Tricoph'yton. See BARBER'S ITCH; RINGWORM.

Tricycle. See BICYCLE.

Triden'tine Creed, the profession of the Tridentine faith, published by Pope Pius IV., in 1564. It originally consisted of the Nicene creed, with a summary of the Tridentine definitions, to which is now added a profession of belief in the decrees of the Vatican Council. See TRENT, COUNCIL OF.

Trid'ymite, a mineral occurring in small, hexagonal tabular crystals in trachyte and other volcanic rocks. Chemically it is pure silica and therefore identical with quartz, from which it differs in its form and lower specific gravity, 2.3. It was first found in Mexico in 1868, but has since been recognized in many localities in Europe, New Zealand, Iceland and the United States. Probably the finest specimens come from Euganean Hills, northern Italy. Its name refers to its frequent occurrence in "three-fold" twin crystals, or trillings.

Trieber, trē'bėr, **Jacob**, American jurist: b. Germany 6 Oct. 1853. He was taught in the German common schools and those of Saint Louis, Mo., and after studying law was admitted to the bar at Helena, Ark., May 1876. In 1891 he received the Republican nomination for United States senator and was delegate to the National Republican Convention, 1880, 1884, 1888, 1896. He was appointed United States attorney at Little Rock, 1897–1900, and since 1900 has been United States district judge for the eastern district of Arkansas.

Trien'nial Act, the name commonly given to the Act of Parliament 16 Charles II., "for the assembling and holding of Parliaments once in three years at least." This act was confirmed after the revolution of 1688, by 6 William and Mary, cap. ii. The Septennial Act 1 George I. cap. xxxviii., passed 7th May, 1716, empowered Parliaments to sit for seven years.

Triest, trē-ĕst'. (Italian TRIESTE, the ancient TERGESTEUM), Austria, the principal seaport of the empire, forming by itself a crown-land between Görz and Istria in the Coastland, and situated at the head of the Gulf of Triest, the extreme upper portion of the Adriatic Sea. The city rises from the water in an amphitheatre formed by the sloping escarpment of the Karst plateau. The old town has narrow and crooked streets, but in the newer portions, surrounding it on nearly all sides, the streets are broad and regular, with numerous open squares, ornamented with fountains and monuments. The cathedral of San Giusto stands on an eminence on the site of an old Roman temple. Other notable buildings are the magnificent city-hall, the old exchange, the fine building of the Austrian Lloyd, the elegant palace of Revoltella, now a municipal museum, and the large *Teatro Politeama*. There are also remains of a Roman theatre and aqueduct. The principal educational institutions are the commercial and nautical academy with an observatory, two German and two Italian high schools, a military academy, a public library, and archæological museum. The manufactures include soap, candles, confectionery, playing cards and saddlery, and there are breweries, iron foundries, large petroleum refineries, machine shops, oil and linoleum factories, and shipyards. The city is chiefly important for its commerce. During the last decade, however, the progress has not been so rapid, owing to keen competition, and to the fact that Triest ceased to be a free port in 1891, after having been so for nearly two centuries. A great extension of the harbor, to be completed as a free port in 1912, has, however, been undertaken. Triest is the headquarters of the great Austrian Lloyd Steamship Company. The principal articles of export are sugar, wool and woolen goods, paper, timber and coal, clothing, metal ware, instruments and watches, and glassware. The chief imports are cotton, coffee, fruits and vegetables, hides and animal products, oil, flax and tobacco. The total annual exports by land and sea amount to about $132,000,000; and the imports to $145,000,000. The clearings at the port in 1902 aggregated 2,395,917 tons. Pop. (1900) 178,599.

Trifo'rium, in Gothic architecture, a gallery or open space in church buildings between the arches of the nave and the roof of the aisles below the clerestory lighted by windows opening into the interior of the building.

Trigger-fish, one of the fishes of the plectognath family *Balistidæ*, in which when the dorsal fin is erected, the first ray, which is very thick and strong, holds its elevated position so firmly that it cannot be pressed down; but if the second ray be depressed, the first immediately falls down like the hammer of a gun when the trigger is pulled. The 8 or 10 genera and about 100 species are all inhabitants of warm seas. A single species (*B. carolinensis*) of the typical genus *Balistes* occasionally wanders northward on the Atlantic coast as far as Cape Cod. It is a rather handsome fish with the body enclosed in a heavy armor of scales, and has three stout dorsal spines. The fool-fishes or file-fishes (q.v.), so called on account of their large, expressionless, staring eyes and rough prickly skins, are closely related. In West Indian waters are many representatives of these and other genera and especially of Balistes.

Triggs, Oscar Lovell, American educator: b. Greenwood, Ill., 2 Oct. 1865. He was graduated from the University of Minnesota in 1889, studied at the universities of Oxford and Berlin in 1890, and was teacher of English in the University of Chicago 1892–1903. He was editor of Lydgate's 'Assembly of Gods' (1895); co-editor of 'Complete Works of Walt Whitman' (10 vols., 1902); etc., and has written 'Browning and Whitman; a Study in Democracy' (1893); 'Chapters in the History of the Arts and Crafts Movement' (1903); etc.

Triglidæ, a family of acanthopterygian fishes, deriving its name from *Trigla*, its typical genus, and related to the *Cottidæ*. This family is noted because of the fact that the cheeks are covered with bony plates, and the head armed with spines, or have membraneous appendages; the eyes are set high in the head; one of the suborbitals is very large; the jaw is protracted; there are two dorsal fins, the rays of the first spinous; the first rays of the other fins, except the caudal, are often of the same structure, while all the fins are greatly developed. The family may be divided into six sub-families: (1) *Genus Dactylopteræ*, in the species of which genus the pectoral fins are of sufficient length to enable the fish to support itself in the air for a short time. There are two species, *D. volitans* and *D. orientalis;* (2) *Genus Trigla*, typified by *T. cuculus*, *T. hirundo*, *T. lyra*, *T. gurnadus*, the American species, *Prionotus Carolinus*, *P. tribulus*, *P. punctatus*, etc.; (3) *Genus Cottus*, including *C. gobio*, *C. scorpius*, *C. bubalis*, *C. quadricornis*, *C. Virginianus*, *C. œnus*, *C. Mitchillii*, etc.; (4) *Genus Aspidophorus*, to which belongs the armed bull-head, *A. Europæus*, noted for being completely covered with horny scales; (5) *Genus Sebastes*, the spines of its main specie, *S. Norvegicus*, being used in Greenland for needles; (6) *Genus Gasterosteus*, which includes the *Sticklebacks*, the most prominent of which are *G. trachurus*, *G. spinachia*, *G. biaculeatus*, *G. neoboracencis*, *G. quadracus*, and *G. occidentalis*.

Tri'glyph, in architecture, ornaments repeated at equal intervals in the Doric frieze. Each triglyph consists of two entire gutters or channels cut to a right angle, called glyphs, and separated by their interstices, called femora, from each other, as well as from two other half-channels that are formed at the sides.

Trigonometry, invented to meet the needs of astronomy, was for centuries (see TRIGONOMETRY, HISTORY OF) little more than a useful art. At length it was advanced, chiefly by the Swiss mathematician, Leonard Euler, to the dignity of a science. At present, as both an art and a science, it has most intimate connections with nearly every branch of mathematics pure and applied. The aim of this article is to give briefly an intelligible account of the subject with some regard to both its practical and its theoretic aspects.

PLANE TRIGONOMETRY.

Conventions and Definitions.—Any two perpendicular lines, as $X'OX$ and YOY', divide the unbounded plane into four congruent portions, called *quadrants*, which hang together about the *origin* O and of which XOY, YOX', $X'OY'$, $Y'OX$, taken in order, are known respectively as the 1st, 2d, 3d, and 4th.

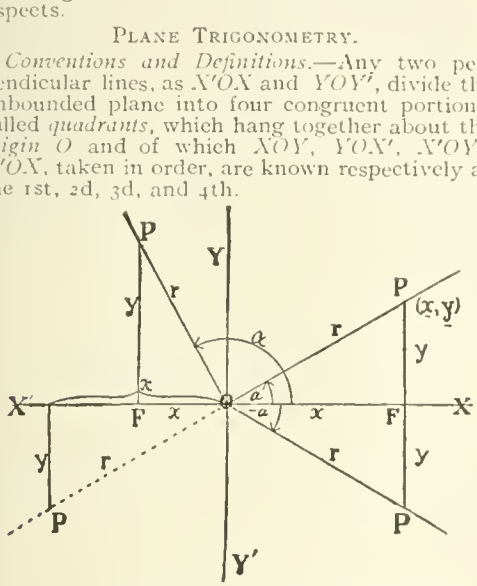


FIG. 1.

The *amount of turning* (about O and in the plane) of a half-line, as OX, which will bring it to coincide with another half-line, as OP, is called the *angle* between them. The angle is regarded *positive* or *negative* according as the turning is counter-clockwise or clockwise. If a half-line turn quite round, so as to coincide with its initial position, it is said to turn through or to generate a *whole*, or round, angle, or perigon. The *unit*-angle used in practical computation is the 360th part of the whole angle, and is named *degree*. The *unit*-angle employed in theoretic investigation is the angle generated by the turning of a half-line, as OP, till one of its points, as P, describes a circle arc equal in length to the segment OP. This unit-angle is named *radian*, being subtended by an arc equal to its radius. Either unit is readily expressible in terms of the other. Thus the whole angle, or 360°, being equal to 2π radians, where π is the ratio of the circumference to the diameter of a circle (see GEOMETRY, ELEMENTARY PURE), it is seen that 1 radian = 57.3° (approximately), π radians = 180°, $\frac{\pi}{2}$ = 90°, $\frac{\pi}{4}$ = 45°, etc. From the definition of angle, it is clear that an angle may exceed 2π. Suppose, for example, that OX generates an angle α (Fig. 1) and then turns through 2π; it will thus have generated the angle $\alpha + 2\pi$. The half-lines bounding an angle are called its beginning and end. Except when otherwise stated or unmistakably implied, all angles will be thought as beginning at OX, *origin of angles*.

$X'OX$ and YOY' are named coördinate axes (see GEOMETRY, CARTESIAN); the former, the axis of *abscissæ*, or X-axis; the latter, the axis of ordinates, or Y-axis. Distances on or parallel to the X-axis are considered *positive* if measured *rightward*, *negative* if *leftward*; distances on or parallel to the Y-axis are *positive* if measured *upward*, *negative* if *downward*. Accordingly, to each point in the plane (Fig. 1) corresponds a unique pair of numbers, its abscissa and ordinate, its x and y; and conversely.

Definitions of the Trigonometric Functions.—On OP, making *any* angle α with OX, take *any* point P. Complete the figure as indicated, denoting the lengths of OF, FP, and OP by x, y, and r respectively. Plainly the values of x, y, and r vary with the position of P on OP, but, and this is important, their *ratios* do *not*. These ratios do vary, however, and this, too, is important to note, with the value or size of the angle α. Because of this reciprocal dependence of the ratios on α and of α on the ratios, the latter are called *functions* of α, and conversely. Because of their importance, the ratios, or trigonometric functions of the angle, have received names and symbols, as follows:

$$\frac{y}{r} = \text{sine of } \alpha = \sin \alpha,$$

$$\frac{r}{y} = \text{cosecant of } \alpha = \operatorname{cosec} \alpha,$$

$$\frac{x}{r} = \text{cosine of } \alpha = \cos \alpha,$$

$$\frac{r}{x} = \text{secant of } \alpha = \sec \alpha,$$

$$\frac{y}{x} = \text{tangent of } \alpha = \tan \alpha,$$

$$\frac{x}{y} = \text{cotangent of } \alpha = \cot \alpha.$$

These equations serve to define $\sin \alpha$ and $\cos \alpha$ for *all* finite values of α. For any one of the other functions the denominator of the defining ratio becomes zero for certain values of α. Division by zero, being meaningless, is inadmissible. For such values of α, therefore, these functions are not defined. Thus, *e.g.*, the tan is not defined for $\alpha = 90°$. It is indeed customary to write $\tan 90° = \infty$, but this is merely short for saying that, as α approaches 90°, $\tan \alpha$ increases beyond every assignable (finite) value.

Range of Variation and Periodicity.—It is readily seen that, if α (Fig. 1) increase or decrease by 2π, then x, y, and r regain their initial values. Hence $\sin(\alpha + 2n\pi) = \sin \alpha$, n being any psoitive or negative integer. Similarly for the other functions. Hence the functions are *periodic*, having the period 2π. It is to be noted, however, that an increase or decrease of α by π alone merely reverses x and y in sign, their ratios remaining the same. Accordingly *the* period of tan and cot is π. The periodicity of the trigonometric functions, it is, that gives them their great value in Analysis. Each function assumes all the values of its range as α varies through the period of the function. As α varies continuously from 0 to 2π, $\sin \alpha$ changes continuously, increasing from 0 for $\alpha = 0$ to 1 for $\alpha = \frac{\pi}{2}$, then decreasing to 0 for $\alpha = \pi$, then changing sign and decreasing (algebraically)

to -1 for $\alpha = \frac{3\pi}{2}$, then increasing to 0 for $\alpha = 2\pi$. Meanwhile cos α runs continuously through the same circuit of values, though in different order, beginning and ending with 1, and changing sign at $\alpha = \frac{\pi}{2}$ and $\frac{3\pi}{2}$. Hence sin and cos are restricted to the values 1, -1, and intermediate values. Not so the other functions, however. Both tan and cot assume *all* finite real values, and also vary continuously with α except for those angle values for which, as noted, the definitions fail. For any such value, the function is said to be discontinuous. For example, as α increases through 90°, tan α *leaps* from being great at will and positive to being great at will and negative. The sec and the cosec each assumes every finite real value except those between 1 and -1.

Geometric Depiction.—The above indicated courses of variation of the trigonometric functions may be readily represented graphically, namely, by the so-called curves of sine, cosine, tangent, etc. These are found by the familiar method of analytical geometry (see GEOMETRY, CARTESIAN) for plotting the graph of a function of a real variable. A convenient unit of length is chosen to represent the radian, or unit-angle. Angle values are then laid off on the

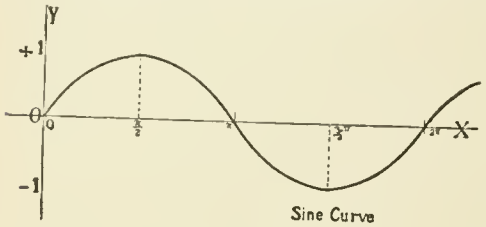


FIG. 2.

X-axis and corresponding function values parallel to the axis of Y. A sufficient number of points being thus determined, a smooth curve, called the graph of the function, is drawn through them. The curve in Fig. 2 is part of the sine curve, or sinusoid. The undulations extend rightward and leftward (for negative angles) indefinitely. The curve of cosines is identical in form with the sinusoid and may be obtained in position from the latter by translating it as a rigid figure leftward through $\frac{\pi}{2}$ units of length. For graphs of the remaining functions, the reader is referred to recent textbooks of trigonometry and analytical geometry. All the graphs in question are *transcendental* curves (see HIGHER PLANE CURVES, also CALCULUS), being intersected by any straight line of the plane in an infinite set of points, real or imaginary.

Functions of Negative Angles.—By reference to Fig. 1 and their definitions, it is immediately seen that the functions of α and the corresponding functions of $-\alpha$ are equal in value but, excepting cos and sec, reversed in sign. Thus, symbolically, $\sin \alpha = -\sin(-\alpha)$, $\cos \alpha = \cos(-\alpha)$. Accordingly, cos and sec are called *even*, while the others are called *odd*, functions of the angle, in obvious analogy with the behavior of signs in case of powers of positive and negative quantities.

Complements, Supplements, Explements.—Two angles are called explements, supplements, or complements, of each other, according as their sum is 2π, π, or $\frac{\pi}{2}$. Any pair of explements are representable by the symbols $\pi + \alpha$ and $\pi - \alpha$; any two supplements by $\frac{\pi}{2} + \alpha$ and $\frac{\pi}{2} - \alpha$; any two complements by $\frac{\pi}{4} + \alpha$ and $\frac{\pi}{4} - \alpha$. The query is natural: how are the values of a function of two explements, or two supplements, or two complements, related? By reference to Fig. 3, it is plain that $\sin(\pi + \alpha) = -\sin(\pi - \alpha)$ and that $\cos(\pi + \alpha) = \cos(\pi - \alpha)$, since $y = -y'$, $x = x'$, and $r = r'$; hence: *sines of explements are equal in value and opposite in sign; cosines of explements are equal.* In like manner may be detected all the relationships in question, tabulated below:

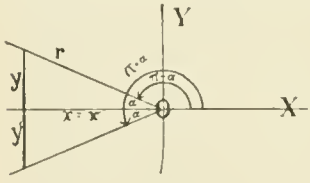


FIG. 3.

Explements, Fig. 3.

$$\sin(\pi + \alpha) = -\sin(\pi - \alpha),$$
$$\cos(\pi + \alpha) = \cos(\pi - \alpha),$$
$$\tan(\pi + \alpha) = -\tan(\pi - \alpha),$$
$$\cot(\pi + \alpha) = -\cot(\pi - \alpha),$$
$$\sec(\pi + \alpha) = \sec(\pi - \alpha),$$
$$\operatorname{cosec}(\pi + \alpha) = -\operatorname{cosec}(\pi - \alpha);$$

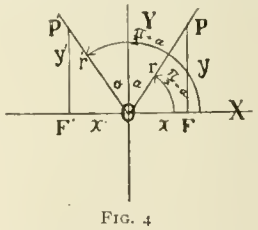


FIG. 4

Supplements, Fig. 4.

$$\sin\left(\frac{\pi}{2} + \alpha\right) = \sin\left(\frac{\pi}{2} - \alpha\right),$$
$$\cos\left(\frac{\pi}{2} + \alpha\right) = -\cos\left(\frac{\pi}{2} - \alpha\right),$$
$$\tan\left(\frac{\pi}{2} + \alpha\right) = -\tan\left(\frac{\pi}{2} - \alpha\right),$$
$$\cot\left(\frac{\pi}{2} + \alpha\right) = -\cot\left(\frac{\pi}{2} - \alpha\right),$$
$$\sec\left(\frac{\pi}{2} + \alpha\right) = -\sec\left(\frac{\pi}{2} - \alpha\right),$$
$$\operatorname{cosec}\left(\frac{\pi}{2} + \alpha\right) = \operatorname{cosec}\left(\frac{\pi}{2} - \alpha\right);$$

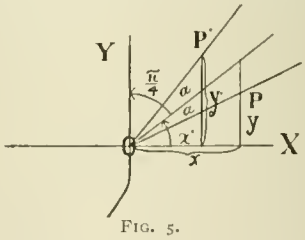


FIG. 5.

Complements, Fig. 5.

$$\sin\left(\frac{\pi}{4} + \alpha\right) = \cos\left(\frac{\pi}{4} - \alpha\right),$$
$$\cos\left(\frac{\pi}{4} + \alpha\right) = \sin\left(\frac{\pi}{4} - \alpha\right),$$
$$\tan\left(\frac{\pi}{4} + \alpha\right) = \cot\left(\frac{\pi}{4} - \alpha\right),$$
$$\cot\left(\frac{\pi}{4} + \alpha\right) = \tan\left(\frac{\pi}{4} - \alpha\right),$$
$$\sec\left(\frac{\pi}{4} + \alpha\right) = \operatorname{cosec}\left(\frac{\pi}{4} - \alpha\right),$$
$$\operatorname{cosec}\left(\frac{\pi}{4} + \alpha\right) = \sec\left(\frac{\pi}{4} - \alpha\right).$$

Note that in Fig. 4, $r=r'$, $y=y'$, $x=-x'$; that in Fig. 5, $OP=OP''=r=r'$, and that, from similar triangles, $x=y'$, $x'=y$. Note, too, that in any of the tables, the sine and cosine relations determine the others, as should be so, since tan and cot are the *ratios*, while cosec and sec are respectively the *reciprocals*, of sin and cos. The mentioned determination is but a special manifestation of the

Interdependence of the Functions.—There is in trigonometry only a single fundamental or characteristic notion, as, say, that of sine—a fact that accounts for the proverbial high degree of plasticity or malleability of the subject matter. Any one of the six functions is derivable from, and expressible in terms of, each of the others. Of such interdependence the definitions themselves of the functions afford illustration. At the same time they furnish the clue to its explicit determination. Thus, squaring and adding corresponding members of the defining equations of sin and cos, and noting that $x^2+y^2=r^2$, one finds the fundamental relation: $\sin^2\alpha+\cos^2\alpha=1$, whence $\sin\alpha=\sqrt{1-\cos^2\alpha}$, and $\cos\alpha=\sqrt{1-\sin^2\alpha}$; from which, if either $\sin\alpha$ or $\cos\alpha$ be known, the other may be found. In any of the better recent text-books of trigonometry may be found a readily constructible table expressing each function in terms of each of the remaining ones. The theory of the six trigonometric functions is ultimately the doctrine of a single one of them.

A Table of Critical Values.—Certain critical values of the angle occur so frequently alike in theory and in practice that it seems desirable to tabulate the corresponding function values. The latter may be readily found from the func-

$\alpha=$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	π	$\frac{5\pi}{4}$	$\frac{3\pi}{2}$	$\frac{7\pi}{4}$	2π	$\frac{9\pi}{4}$
$\sin=$	0	$+\sqrt{\frac{1}{2}}$	1	$+\sqrt{\frac{1}{2}}$	0	$-\sqrt{\frac{1}{2}}$	-1	$-\sqrt{\frac{1}{2}}$	0	
$\cos=$	1	$+\sqrt{\frac{1}{2}}$	0	$-\sqrt{\frac{1}{2}}$	-1	$-\sqrt{\frac{1}{2}}$	0	$+\sqrt{\frac{1}{2}}$	1	$\frac{\pi}{4}$
$\sec=$	1	$+\sqrt{2}$	∞	$-\sqrt{2}$	-1	$-\sqrt{2}$	∞	$+\sqrt{2}$	1	for
$\operatorname{cosec}=$	∞	$+\sqrt{2}$	1	$+\sqrt{2}$	∞	$-\sqrt{2}$	-1	$-\sqrt{2}$	∞	as
$\tan=$	0	1	∞	-1	0	1	∞	-1	0	Same
$\cot=$	∞	1	0	-1	∞	1	0	-1	∞	

tion definitions by help of Fig. 1 and the three preceding tables. Other angle values of notably frequent occurrence are 30°, or $\frac{\pi}{6}$, and 60°, or $\frac{\pi}{3}$. To find the value of sin 30°, observe, Fig. 1, that, if $\alpha=30°$, y is the half-chord of 60°, *i.e.*, $y=\frac{r}{2}$; whence $\sin 30°=\frac{1}{2}$. From this, by means of the relation, $\cos\alpha=\sqrt{1-\sin^2\alpha}$, it is seen that $\cos 30°=\frac{1}{2}\sqrt{3}$; from this last, since $\cos\left(\frac{\pi}{4}+\alpha\right)=\sin\left(\frac{\pi}{4}-\alpha\right)$, $\sin 60°=\frac{1}{2}\sqrt{3}$; and, similarly, $\cos 30°=\frac{1}{2}$. Thence, by definitions and foregoing formulæ, $\tan 30°=\cot 60°=\frac{1}{\sqrt{3}}$, $\tan 60°=\cot 30°=\sqrt{3}$; $\sec 30°=\operatorname{cosec} 60°=\frac{2}{\sqrt{3}}$, $\sec 60°=\operatorname{cosec} 30°=2$. Analogously and by means of relationships to be subsequently given, function values corresponding to many other angles, as well as solutions of the inverse problem, admit of explicit determination. Such methods are, however, in general inconvenient, and, in problems of computation, the determinations in question are, as a rule, effected by means of logarithmic tables (see ALGEBRA, and below).

The Laws of Sine, Cosine, and Tangent.—Such may be named the three famous formulæ, now to be presented, that serve for the solution of any triangle, *i.e.*, for the explicit determination of the remaining parts of a triangle of which any three independent parts are known. By reference to Fig. 6, it is seen that $\sin\alpha=\frac{a}{2r}$;

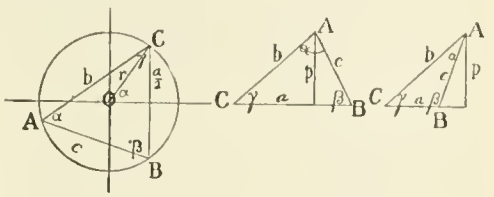


FIG. 6. FIG. 7.

similarly, $\sin\beta=\frac{b}{2r}$ and $\sin\gamma=\frac{c}{2r}$; whence, for any triangle of sides a, b, c, and angles α, β, γ, there holds the relation: $\frac{a}{\sin\alpha}=\frac{b}{\sin\beta}=\frac{c}{\sin\gamma}=2r$, r being the radius of the circumscribed circle. This relation is the LAW OF SINES. It is plain, Fig. 7, that $a=b\cos\gamma+c\cos\beta$, whence $c\cos\beta=a-b\cos\gamma$; squaring, $c^2\cos^2\beta=a^2+b^2\cos^2\gamma-2ab\cos\gamma$; by law of sines, $c\sin\beta=b\sin\gamma$; squaring this, adding to the preceding equation, and noting that $\sin^2+\cos^2=1$, there results $c^2=a^2+b^2-2ab\cos\gamma$. This and the analogous equations, $b^2=c^2+a^2-2ca\cos\beta$, $a^2=b^2+c^2-2bc\cos\alpha$, similarly obtainable, together constitute the LAW OF COSINES. The LAW OF TANGENTS, deduced at a later stage of this writing, is, $a+b:a-b=\tan\frac{1}{2}(\alpha+\beta):\tan\frac{1}{2}(\alpha-\beta)$, where a and b are any two sides, and α and β are the corresponding angles, of any triangle.

Addition Theorems.—These serve to express functions of an angle in terms of the like or unlike functions of its parts. Let $OP=OP'=r=r'$ in Fig. 8; α' and α any two angles. It

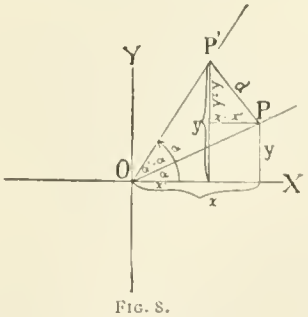


FIG. 8.

is evident that $x=r\cos\alpha$, $x'=r\cos\alpha'$ $y=r\sin\alpha$, $y'=r\sin\alpha'$. Also, by the Pythagorean theorem and the law of cosines, $d^2=(x-x')^2+(y-y')^2=2r^2-2r^2\cos(\alpha'-\alpha)$; whence, on substituting

$r\cos\alpha$, etc., and reducing, it is found that $\cos(\alpha'-\alpha)=\cos\alpha'\cos\alpha+\sin\alpha'\sin\alpha$. The four formulæ

(1) $\cos(\alpha-\beta)=\cos\alpha\cos\beta+\sin\alpha\sin\beta$,

(2) $\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta$,

(3) $\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta$,

(4) $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta$,

are together named the *Addition Theorem for Sine and Cosine*. Formula (1) is equivalent to the preceding one; (2) results from (1) on replacing $-\beta$ for β; (3) from (1) on writing $\frac{\pi}{2}-\alpha$ for α; and (4) from (3), as (2) from (1). Dividing (4) by (1), and both terms of the resulting right-hand quotient by $\cos\alpha\cos\beta$, there results: $\tan(\alpha-\beta)=(\tan\alpha-\tan\beta):(1+\tan\alpha\tan\beta)$, which with the relation, $\tan(\alpha+\beta)=(\tan\alpha+\tan\beta):(1-\tan\alpha\tan\beta)$, constitutes the *Addition Theorem for the Tangent*. The analogous relations for the remaining functions are omitted as being but little used.

Prosthaphæretic Formulæ.—From the addition theorems, which concern functions of *angle* sums and differences, may be easily deduced equally important formulæ concerning *function* sums and differences. Replacing $\alpha+\beta$ by u and $\alpha-\beta$ by v in (1), (2), (3), (4), adding (3) and (4), then (1) and (2), and then taking the corresponding differences, one obtains the four formulæ:

(5) $\sin u+\sin v=2\sin\frac{1}{2}(u+v)\cos\frac{1}{2}(u-v)$,

(6) $\cos u+\cos v=2\cos\frac{1}{2}(u+v)\cos\frac{1}{2}(u-v)$,

(7) $\sin u-\sin v=2\cos\frac{1}{2}(u+v)\sin\frac{1}{2}(u-v)$,

(8) $\cos u-\cos v=-2\sin\frac{1}{2}(u+v)\sin\frac{1}{2}(u-v)$.

These relations, which have been named *prosthaphæretic*,* express sums and differences in terms of products, and so render them suitable for logarithmic computation.

Some Important Deductions from Foregoing Formulæ.—Setting $\alpha=\beta$ in (2) and (3), there result

(9) $\cos 2\alpha=\cos^2\alpha-\sin^2\alpha$,

(10) $\sin 2\alpha=2\sin\alpha\cos\alpha$.

The former combined with the relation $1=\sin^2\alpha+\cos^2\alpha$ yields

(11) $1+\cos 2\alpha=2\cos^2\alpha$,

(12) $1-\cos 2\alpha=2\sin^2\alpha$.

Again, putting $\alpha=\beta$ in addition theorem of tangent, the result is $\tan 2\alpha=2\tan\alpha:(1-\tan^2\alpha)$. Division of (12) by (11) yields $(1-\cos 2\alpha):(1+\cos 2\alpha)=\tan^2\alpha$, whence follow

(13) $\cos 2\alpha=\frac{1-\tan^2\alpha}{1+\tan^2\alpha}$,

(14) $\sin 2\alpha=\frac{2\tan\alpha}{1+\tan^2\alpha}$.

Once more, by definition $\tan\alpha=\sin\alpha:\cos\alpha$. Squaring each member and adding 1 to each square, one finds the most used of secant formulæ, $\sec^2\alpha=1+\tan^2\alpha$. The corresponding cosecant relation is $\operatorname{cosec}^2\alpha=1+\cot^2\alpha$. Hosts of other more or less useful and interesting kindred formulæ, readily deducible, may be found in the current text-books and in pocket manuals for engineers. This paragraph will be closed with a deduction of the above-presented Law of Tangents. By the Law of Sines, $a:b=\sin\alpha:\sin\beta$; whence, by "composition and division," $(a+b):(a-b)=(\sin\alpha+\sin\beta):(\sin\alpha-\sin\beta)$; expanding the right-hand member by (4) and (3), and applying the definition of tangent, the relation sought is found to be $(a+b):(a-b)=\tan\frac{1}{2}(\alpha+\beta):(\tan\frac{1}{2}(\alpha-\beta)$.

Solution of Triangles.—Etymologically TRIGONOMETRY is *triangle measurement*, and, though the science wonderfully exceeds the verbal significance of its name, yet measurement of triangles is a very important, and, at the same time, the most generally familiar, one of its manifold applications. A triangle is determined by *three independent data*, of which the simplest are: two sides and an angle; two angles and a side; three sides. The three angles are *not independent*, any pair of them determine the third angle. Let a, b, c denote the lengths of the sides, and α, β, γ the corresponding (opposite) angles, of any triangle. The data being those mentioned, three cases arise: (i) given a *pair* of *opposite* parts, and one other, as a, α, and b, or α, a, and β, to find the remaining parts; (ii) given three *adjacent* parts, as a, γ, and c, or α, c, and β, to find the rest; (iii) given three *alternate* parts, a, b, and c, to find the angles. In case (i), it is sufficient to employ the Law of Sines; in (ii), the Law of Tangents; in (iii), the Law of Cosines. In (i), if the "one other" part be a side, as b, the Sine Law yields the sine of β, the opposite angle. But, as $\sin\beta=\sin(\pi-\beta)$, the problem presents an ambiguity, which, in every actual example, is readily resoluble by easy considerations explained in every text-book of trigonometry. The Cosine Law is equivalent to the equation: $\cos\alpha=(b^2+c^2-a^2):2bc$. The numerator not being a product, the formula is not adapted to logarithmic use. From it, however, is readily derived an adequate formula that is so adapted. It is

(15) $\tan\frac{1}{2}\alpha=\frac{1}{s-a}\sqrt{\frac{(s-a)(s-b)(s-c)}{s}}$,

where s is $\frac{1}{2}(a+b+c)$. Similar relations hold for β and γ. The significance of (15) and its elements is further exhibited by Fig. 9, any

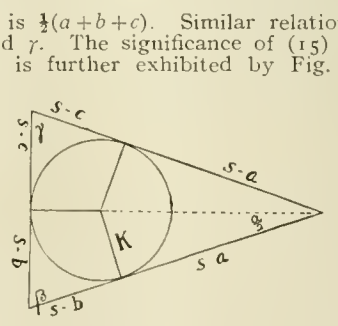


FIG. 9.

triangle and its inscribed circle. The radius K is precisely equal to the radical of (15), whence, if T denote the *area* of the triangle, $T=sK=\sqrt{s(s-a)(s-b)(s-c)}$, a formula attributed to Hero of Alexandria (about 125 B.C.).

* So called by Prof. W. B. Smith. *Prosthaphæresis* was a method of computation invented by Wittig, a pupil of Tycho Brahe. The method has been superseded by logarithms.

Triangle Solution Exemplified. — Given $a=32.456$, $b=41.724$, $c=53.987$; required the angles. Applying logarithms to (15),

$$\log\tan\tfrac{1}{2}\alpha=\log K-\log(s-a).$$

$$s=64.084,\quad (s-a)=31.628,$$

$$(s-b)=22.36,\quad (s-c)=10.097,$$

$$\log(s-a)=1.50007,\quad \log(s-b)=1.34947,$$

$$\log(s-c)=1.00419,\quad \operatorname{colog} s=8.19325-10.$$

Summing and taking half,

$$\log K=1.02349;\quad \log(s-a)=1.50007;$$

whence

$$\log\tan\tfrac{1}{2}\alpha=9.52342-10,$$

whence

$$\tfrac{1}{2}\alpha=18^\circ\ 27'\ 23'',\quad \alpha=36^\circ\ 54'\ 46''.$$

In like manner one may find $\beta=50^\circ\ 32'\ 32''$, and $\gamma=92^\circ\ 32'\ 44''$. As a *check* one finds $\alpha+\beta+\gamma=180^\circ\ 0'\ 2''$, an excess regarded in practice as very slight and in most work negligible. To secure more accurate results, which is seldom necessary, it suffices to employ logarithms of more than five decimal places.

Inverse Trigonometric Functions.—The symbols $\sin^{-1}u$, $\cos^{-1}u$, $\tan^{-1}u$, etc., denote respectively an *angle* whose sine is u, whose cosine is u, etc. They are variously read *inverse* sine, cosine, etc., of u, or *anti-sine*, etc., of u, or, again, the *arc* or *angle* whose sine, cosine, etc., is u. They are called *inverse* trigonometric or circular functions, being related to the direct (so-called) trigonometric or circular functions much as are the integral and the derivative of the Calculus (which see), or the logarithm and the exponential of Algebra (which see). Like analogies abound. It should be noted that $\sin^{-1}$, $\cos^{-1}$, etc., do *not* signify reciprocal of sin, cos, etc. Moreover, unless the contrary is expressed, it is generally understood that $\sin^{-1}u$, etc., shall signify the *smallest* one of the infinitely many angles whose sine, etc., is u. Thus $\sin^{-1}\frac{1}{2}$ will ordinarily mean 30°, though, taken in full generality, it would signify $30^\circ\pm 2n\pi$, or $150^\circ\pm 2n\pi$, n being any integer. The direct functions are one-valued functions of the angle, but the angle is an infinitely many-valued function of a direct-function value.

Trigonometric Equations.—These are such as involve one or more direct or inverse trigonometric functions regarded as the unknowns or variables like the x, y, etc., of ordinary algebra. Such an equation, for example, is $\sin\alpha+\sin 5\alpha=\sin 3\alpha$. To solve it, apply formula (5); then $2\sin 3\alpha\cos 2\alpha=\sin 3\alpha$; whence either $\sin 3\alpha=0$, or $2\cos 2\alpha=1$; hence either $\alpha=n\pi\div 3$ or $\alpha=n\pi\pm\pi\div 6$. For another example, let $\sin^{-1}\frac{3}{5}-\cos^{-1}\frac{12}{13}=\sin^{-1}x$, to find x. Denote $\sin^{-1}\frac{3}{5}$, $\cos^{-1}\frac{12}{13}$, and $\sin^{-1}x$ by α, β, and γ respectively. Then $\sin\alpha=\frac{3}{5}$, $\cos\alpha=\frac{4}{5}$, $\cos\beta=\frac{12}{13}$, $\sin\beta=\frac{5}{13}$, $\sin\gamma=x$. Also $\alpha-\beta=\gamma$, and $\sin(\alpha-\beta)=\sin\alpha\cos\beta-\cos\alpha\sin\beta=\sin\gamma=x$; substituting the values of $\sin\alpha$, etc., it is found that $x=\frac{16}{65}$. For applications to the solution of the general cubic equation in one unknown, the reader is referred to the article on Algebra or that on Theory of Equations.

Some Trigonometric Series.—Consider the infinite series

$$(s)\quad \sin\alpha=\alpha-\frac{\alpha^3}{1\cdot 2\cdot 3}+\frac{\alpha^5}{1\cdot 2\cdot 3\cdot 4\cdot 5}-\frac{\alpha^7}{1\cdot 2\cdot\ldots\cdot 7}+\ldots,$$

$$(c)\quad \cos\alpha=1-\frac{\alpha^2}{1\cdot 2}+\frac{\alpha^4}{1\cdot 2\cdot 3\cdot 4}-\frac{\alpha^6}{1\cdot 2\cdot\ldots\cdot 8}+\ldots.$$

It may be proved algebraically, and is proved by means of Maclaurin's Expansion (see Calculus), that the series (s) and (c) respectively represent or define $\sin\alpha$ and $\cos\alpha$ for every *finite* value of the angle α reckoned in terms of the radian. The precise meaning is that, if S_n denote the sum of the first n terms of (s), then the *limit* of S_n as n increases endlessly is $\sin\alpha$. Similarly for (c). The algebraic proof is too long for insertion here, and that by the Calculus rests on presuppositions not appropriate in this article. As a compromise it is edifying and interesting to *assume* the validity of equations (s) and (c) and then after the manner of natural science to test them, regarded as hypotheses, by their implications, or consequences. Rigorous proof is not thus obtainable, but certainty can be thus more and more nearly approximated. Any consequence of (s) or (c) or both that is known to be untrue would alone suffice to invalidate one or both assumptions absolutely, while any number of consequences known to be true merely *tend* to support but do not suffice to prove the hypotheses. Some such supporting consequences may be noted. If $\alpha=0$, series (s) and (c) become respectively 0 and 1, as should be the case, since $\sin 0=0$ and $\cos 0=1$. If α be replaced by $-\alpha$, each term of (s) is reversed in sign, while (c) is unchanged; and this, too, should be so, for, as before seen, the sin is an *odd*, and the cos an *even*, function of the angle. Again, it is proved in algebra (see Algebra, also Series) that, e being the Napierian base,

$$e^\alpha=1+\alpha+\frac{\alpha^2}{1\cdot 2}+\frac{\alpha^3}{1\cdot 2\cdot 3}+\ldots\text{ ad inf.}$$

for every finite value of α real or imaginary. Writing $i\alpha$ for α, where (after Euler) $i=\sqrt{-1}$, one obtains

$$e^{i\alpha}=\left(1-\frac{\alpha^2}{1\cdot 2}+\frac{\alpha^4}{1\cdot 2\cdot 3\cdot 4}-\ldots\right)+i\left(\alpha-\frac{\alpha^3}{1\cdot 2\cdot 3}+\frac{\alpha^5}{1\cdot 2\cdot 3\cdot 4\cdot 5}-\ldots,\right),$$

or

$$e^{i\alpha}=\cos\alpha+i\sin\alpha.$$

Replacing i by $-i$,

$$e^{-i\alpha}=\cos\alpha-i\sin\alpha.$$

The product of the last two equations yields $1=\cos^2\alpha+\sin^2\alpha$, another result known to be true. Once more,

$$e^{i\alpha}\cdot e^{i\beta}=e^{i(\alpha+\beta)}=\cos(\alpha+\beta)+i\sin(\alpha+\beta);$$

also,

$$e^{i\alpha}\cdot e^{i\beta}=(\cos\alpha+i\sin\alpha)(\cos\beta+i\sin\beta)$$

$$=\cos\alpha\cos\beta-\sin\alpha\sin\beta+i(\sin\alpha\cos\beta+\cos\alpha\sin\beta);$$

whence

$$\cos(\alpha+\beta)=\cos\alpha\cos\beta-\sin\alpha\sin\beta,$$

and

$$\sin(\alpha+\beta)=\sin\alpha\cos\beta+\cos\alpha\sin\beta,$$

two equations of the known addition theorem for sine and cosine. It is indeed a fact that the whole body of trigonometric relations deduced or deducible from the original definitions, Fig. 1, of the functions, are obtainable analytically from (*s*) and (*c*) regarded as definitions, and, like the latter, would then be free from geometric reference. Each of the other functions, direct or inverse, is representable in the form of a series analogous to (*s*) and (*c*). Such series may be found in books of trigonometry and of the calculus.

De Moivre's Theorem.—From $e^{i\alpha}=\cos\alpha+i\sin\alpha$ follows

$$e^{in\alpha}=(\cos\alpha+i\sin\alpha)^n;$$

but $$e^{in\alpha}=\cos n\alpha+i\sin n\alpha,$$

hence $$(\cos\alpha+i\sin\alpha)^n=\cos n\alpha+i\sin n\alpha,$$

a famous theorem due to De Moivre and known as De Moivre's Theorem. Suppose $n=3$, then

$$\cos 3\alpha+i\sin 3\alpha=(\cos\alpha+i\sin\alpha)^3=\cos^3\alpha$$
$$-3\cos\alpha\sin^2\alpha+i(3\cos^2\alpha\sin\alpha-\sin^3\alpha);$$

whence $$\cos 3\alpha=\cos^3\alpha-3\cos\alpha\sin^2\alpha,$$

$$\sin 3\alpha=3\cos^2\alpha\sin\alpha-\sin^3\alpha.$$

Similarly may be expressed sines and cosines of *any multiple* of α in terms of the like functions of the single angle.

Euler's Formulæ. — From the relations $e^{i\alpha}=\cos\alpha+i\sin\alpha$, $e^{-i\alpha}=\cos\alpha-i\sin\alpha$, may be found, by addition and subtraction, the Eulerian equations

$$\cos\alpha=\tfrac{1}{2}(e^{i\alpha}+e^{-i\alpha}),\quad \sin\alpha=\frac{1}{2i}(e^{i\alpha}-e^{-i\alpha}),$$

which are equivalent to (*c*) and (*s*) and serve to define sin and cos in terms of imaginary powers of the Napierian base.

Some Curious Relations.—Letting $\alpha=\frac{\pi}{2}$ in $e^{i\alpha}=\cos\alpha+i\sin\alpha$, we get $e^{\frac{1}{2}\pi i}=i$: squaring, we obtain $e^{i\pi}=-1$; also $e^{\frac{3}{2}\pi i}=-i$, and $e^{2\pi i}1-=0$. The last is especially noteworthy as involving the most notable set of five numbers in mathematics: 0, 1, i, e, π. Further developments would lead into the doctrine of Circle Partition (*Kreistheilung*), which belongs to the *Theory of Functions of the Complex Variable*, to which the reader is referred.

Spherical Trigonometry.

A spherical triangle is the figure bounded by three arcs (of great circles) on the surface of a sphere. Spherical trigonometry has for its principal problem that of determining the numerical values of the three remaining parts of a spherical triangle when three parts are given. This note is confined to triangles whose sides ore each less than a semi-circumference and whose angles are each less than π, or 180°. Any spherical angle is measured by the corresponding diedral angle, and the latter by the plane angle of intersecting lines (in the faces of the diedral angle) drawn perpendicular to its edge. For convenience the triangle will be supposed to be on a sphere of *unit* radius; the sides will then be measured by their corresponding central angles. In all mathematics, every problem of angular measurement is ultimately that of measuring the angle between intersecting lines, as all distance problems are reducible to that of determining the distance between two points.

The Right Spherical Triangle.—Let O be the centre of the unit-sphere containing the triangle CAB right-angled at A. BP being drawn

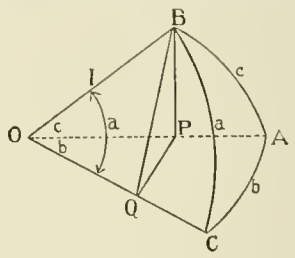


Fig. 10.

perpendicular to OA, and similarly PQ to OC, BQ is perpendicular to OC. By aid of the figure one may readily find in order the relationships:

(1) $\cos a=\cos b\cos c$, (2) $\sin c=\sin a\sin C$,
(3) $\cos C=\cot a\cot b$, (4) $\sin b=\tan c\cot C$,
(5) $\sin b=\sin a\sin B$, (6) $\cos B=\cot a\tan c$,
(7) $\sin c=\tan b\cot B$, (8) $\cos a=\cot B\cot C$,
(9) $\cos B=\cos b\sin C$, (10) $\cos C=\cos c\sin B$.

Sufficient for the solution of any right triangle, these are less convenient than the equivalent derived set presented under the title

Napier's Circular Parts and Rules.—These parts are: $90°-a$, $90°-B$, $90°-C$, b and c. By substitution in the preceding formulæ, these parts are seen to be related as follows:

(1′) $\sin(90°-a)=\cos b\cos c$,
(2′) $\sin c=\cos(90°-a)\cos(90°-C)$,
(5′) $\sin b=\cos(90°-a)\cos(90°-B)$,
(9′) $\sin(90°-B)=\cos b\cos(90°-C)$,
(10′) $\sin(90°-C)=\cos c\cos(90°-B)$;
(8′) $\sin(90°-a)=\tan(90°-B)\tan(90°-C)$,
(7′) $\sin c=\tan b\tan(90°-B)$,
(4′) $\sin b=\tan c\tan(90°-C)$,
(6′) $\sin(90°-B)=\tan(90°-a)\tan c$,
(3′) $\sin(90°-C)=\tan(90°-a)\tan b$.

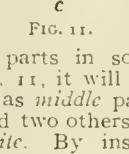


Fig. 11.

Arranging the parts in some such cyclical scheme as in Fig. 11, it will be seen that any part being taken as *middle* part, there are two *adjacent* parts, and two others that may be and are called *opposite*. By inspecting the first half of the preceding table it appears that the sine of any middle part is equal to the product of the cosines of its opposite parts, and, from the second half, that the sine of a middle part is the product of the tangents of its adjacent parts. Such are Napier's rules for circular parts, the more readily remembered by virtue

of the assonances appearing in their statement.

In the solution of right spherical triangles it should be observed: (1) that a is less or greater than 90° according as 90° is not or is intermediate to b and c, these being supposed not equal to 90°; (2) b or c and the opposite angle are both less or both greater than 90°; (3) that corresponding to the data, b or c and the opposite angle, there are two solutions.

Quadrantal Triangles.—Those are so named that have a side equal to 90°. The supplemental polar triangle of a quadrantal is right-angled. Hence to solve a quadrantal, solve its polar and subtract its parts each from 180°.

Oblique Spherical Triangles.—The theory of the oblique spherical triangle is contained in

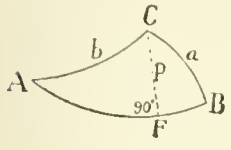


FIG. 12.

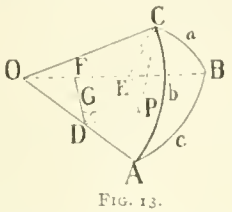


FIG. 13.

the following numbered equations deducible by help of the figures. From Fig. 12 and analogy it is obvious that

(11) $\sin a : \sin b = \sin A : \sin B$,

(12) $\sin b : \sin c = \sin B : \sin C$,

(13) $\sin c : \sin a = \sin C : \sin A$,

three propositions constituting the *Law of Sines* for Spherical Trigonometry. The Law of Cosines, readily found from Fig. 13 (in which CP is perpendicular to the plane AOB, PD, and PE are perpendicular to OA and OB, and PG and DF are parallel to OF and PE), is the triplet:

(14) $\cos a = \cos b \cos c + \sin b \sin c \cos A$,

(15) $\cos b = \cos c \cos a + \sin c \sin a \cos B$,

(16) $\cos c = \cos a \cos b + \sin a \sin b \cos C$.

From these, by passing to the polar triangle (of equal generality with that of Fig. 13), one finds three relations of type

(17) $\cos A = \sin B \sin C \cos a - \cos B \cos C$.

From the law of cosines flow the two triplets of formulæ adapted to logarithmic computation and being respectively of the types

(18) $\tan \tfrac{1}{2}A = \sqrt{\sin(s-b)\sin(s-a)} : \sqrt{\sin s(s-a)}$,

and

(19) $\tan \tfrac{1}{2}a = \sqrt{-\cos(S-A)\cos S} : \sqrt{\cos(S-B)\cos(S-C)}$,

s and S being the *half* sums of the sides and of the angles.

Napier's Analogies.—From (17) by help of the Sine Law are found the so-called *first set* of Napier's analogies, namely

(20) $\cos \tfrac{1}{2}(a+b) : \cos \tfrac{1}{2}(a-b) = \cot \tfrac{1}{2}C : \tan \tfrac{1}{2}(A+B)$,

(21) $\sin \tfrac{1}{2}(a+b) : \sin \tfrac{1}{2}(a-b) = \cot \tfrac{1}{2}C : \tan \tfrac{1}{2}(A-B)$;

and from these, by use of the polar triangle, the *second set:*

(22) $\cos \tfrac{1}{2}(A+B) : \cos \tfrac{1}{2}(A-B) = \tan \tfrac{1}{2}c : \tan \tfrac{1}{2}(a+b)$,

(23) $\sin \tfrac{1}{2}(A+B) : \sin \tfrac{1}{2}(A-B) = \tan \tfrac{1}{2}c : \tan \tfrac{1}{2}(a-b)$.

For ways of resolving the ambiguity incident to the use of the Sine Law, the reader is referred to any standard work on Spherical Trigonometry (see *Bibliography* below).

Plane Trigonometry a Special Case of Spherical.—The ground of the notable resemblances between corresponding plane and spherical formulæ may be made evident by the following considerations: Suppose a plane p tangent to a sphere of radius r at a point P. If r increase without limit, the one-based zone having P for mid-point will flatten, swelling out towards p so as to include *any* given finite point Q near at will but not on p however far Q be from P. Plane p is said to be the *limit* of the *sphere surface* as r increases limitlessly—a relationship commonly expressed briefly by saying that a plane is a sphere of infinite radius. Accordingly the geometry and the trigonometry on a sphere of radius r ought to degrade respectively into plane geometry and plane trigonometry, on taking r infinitely great. To show that and how, in case of trigonometry, such degeneration actually occurs, consider the spherical Sine Law

$$(s) \qquad \frac{\sin a}{\sin \alpha} = \frac{\sin b}{\sin \beta} = \frac{\sin c}{\sin \gamma},$$

where a, b, c are the sides (*i.e.*, the central angles they subtend), and α, β, γ the corresponding angles, of a triangle on a sphere of radius r. Denoting the *lengths* of a, b, c by l, m, n respectively, a, b, $c = \frac{l}{r}, \frac{m}{r}, \frac{n}{r}$ (radian measure). Hence (s) may be written

$$\frac{\sin \frac{l}{r}}{\frac{l}{r}} \cdot \frac{l}{\sin \alpha} = \frac{\sin \frac{m}{r}}{\frac{m}{r}} \cdot \frac{m}{\sin \beta} = \frac{\sin \frac{n}{r}}{\frac{n}{r}} \cdot \frac{n}{\sin \gamma}.$$

Now it may be proved that the *limit of the ratio of the sine to the angle as the angle approaches zero is* 1. Hence as r increases limitlessly and consequently the angles $\frac{l}{r}, \frac{m}{r}, \frac{n}{r}$ (numerators being kept constant, or finite at any rate) approach zero, the foregoing Sine Law degrades into $\frac{l}{\sin \alpha} = \frac{m}{\sin \beta} = \frac{n}{\sin \gamma}$, the Sine Law for *plane* triangles. Similarly, by use of the Sine and Cosine Series, it may be shown that the Cosine Law for the sphere degenerates for $r = \infty$ into the Cosine Law for the plane, and that the Tangent Law for the plane is but a special case of the fourth Napierian analogy, the Law of Tangents for the sphere.

Hyperbolic Functions.—These are associated with the rectangular hyperbola (see CARTESIAN GEOMETRY, and CALCULUS) in a manner similar to the connection of the trigonometric or circular functions with the circle. The hyperbolic functions invented by Lambert (1768), may be defined as follows (compare with the Eulerian formulæ): naming them *hyperbolic sine*, etc., and denoting them by *sinh*, etc., their definitions are, $\sinh \alpha = \tfrac{1}{2}(e^{\alpha} - e^{-\alpha})$, $\cosh \alpha = \tfrac{1}{2}(e^{\alpha} + e^{-\alpha})$, $\tanh \alpha = \sinh \alpha : \cosh \alpha$, etc. Each of the six is expressible in terms of each of the others. Thus, $\cosh^2 \alpha - \sinh^2 \alpha = 1$, $\tanh^2 \alpha + \operatorname{sech}^2 \alpha = 1$, etc.

These functions are most instructively introduced through the integral calculus. For their geometric interpretation the reader is referred to such works as W. B. Smith's 'Infinitesimal Analysis.' Vol. I., and Greenhill's 'Differential and Integral Calculus.'

Pseudo-spherical Trigonometry.— A given sphere has constant positive *curvature* (see CALCULUS). If the radius be infinite, the curvature is *zero*. The plane is a sphere of constant zero curvature. Suppose the curvature to be constant and *negative*. The surface is then called *pseudo-sphere*. This, too, has its trigonometry. Its formulæ are obtainable from those of spherical trigonometry by replacing the circular functions by the corresponding hyperbolic functions.

Bibliography.—Chauvenet, 'Treatise on Plane and Spherical Trigonometry'; Loney, 'Plane Trigonometry'; Todhunter, 'Plane Trigonometry' and 'Spherical Trigonometry.'

CASSIUS J. KEYSER,
Professor of Mathematics, Columbia University.

Trigonometry, History of the Elements of. Among the ancients trigonometry was simply an adjunct to astronomy, and it so remained until comparatively recent times. A slight trace of its application to mensuration is found in the famous papyrus of Ahmes (see ALGEBRA, HISTORY OF THE ELEMENTS OF), where a quotient called *seqt* is mentioned. In the case of the pyramids the *seqt* seems to have been the cosine of the angle of slope of the edge, or in some cases the tangent of the angle of slope of the face. Among the Greeks frequent reference to trigonometry is found among the writings of the astronomers. Hypsicles (c. 190 B.C.) used the Babylonian division of the circumference into 360 degrees, and from this time the sexagesimal fraction became common in astronomy. Hipparchus (c. 150 B.C.) was the first to compute a table of chords, the ancients generally using the chord instead of the half-chord or sine. Hero of Alexandria (see HERO OF ALEXANDRIA) gave rules which are the equivalent of certain modern formulas, and in particular computed the values of $\cot \frac{2\pi}{n}$ for all values of n from 3 to 12 inclusive. Menelaus of Alexandria (c. 100 A.D.) carried the study of Spherics to a considerable prominence, his celebrated *Regula sex quantitatum* relating to the transversal of the sides of a spherical triangle, and he wrote six books on the calculation of chords. It is, however, to Claude Ptolemy (q.v.), c. 125 A.D., that is due the introduction of a formal spherical trigonometry into astronomy. The *Almagest* made the sexagesimal fraction more widely known, and Ptolemy calculated the chords of arcs to a half degree.

The Hindu astronomers used the half chord instead of the chord which the Greeks usually (but not always) employed. They thus used the sine, and they added the versed sine and the cosine, computing tables for these ratios. They also knew the relation, $\sin^2 x + \cos^2 x = 1$.

The Arabs made the greatest advance in trigonometry of any peoples before the Renaissance. Al Battani, or Albategnius as the Latin writers called him, c. 900 A.D., brought into greater prominence the use of the sine, and computed a table of values of $\sin x/\cos x$ and its reciprocal, thus practically using the tangent and cotangent. The present names for the various functions are mostly modern. The name *sinus* seems first to have been used by Gherardo of Cremona, c. 1150, although often attributed to Plato of Tivoli (also c. 1150) in his translation of Al Battani.' Among the western Arabs Jabir ibn Aflah, often known as Geber, was prominent, his trigonometry covering both the plane and the spherical parts.

In Christian Europe the science is first seriously considered in the work of Regiomontanus (q.v.), the famous pupil of Peuerbach (q.v.). The latter had done some excellent work in trigonometry, but he died before he could write his projected treatise, and Regiomontanus carried out his plans. The result was a work which influenced subsequent text-books much as Euclid's 'Elements' influenced plane geometry. The principal formulas of plane and spherical trigonometry are set forth, and the elementary science became crystallized. Subsequent advances have been chiefly in the nomenclature, the symbolism, and the computation of tables, particularly of logarithmic tables. Among the most prominent computers of the values of the functions and of logarithms should be mentioned Rhæticus (1514–76), Pitiscus (1561–1613), Bürgi (1552–1632), Napier (1550–1617), Briggs (1560–1630), and Vlacq, whose tables appeared in 1628.

Bibliography.—Braunmühl, A. von, 'Geschichte der Trigonometrie' (Leipsic, 1900, 1904); Cantor, M., 'Geschichte der Mathematik' (Leipsic, 2d ed. 1894); Gow, J., 'History of Greek Mathematics' (Cambridge, 1884).

DAVID EUGENE SMITH,
Professor of Mathematics, Teachers College, Columbia University, New York.

Trikala, tré'kä-lä, or **Trikkala,** Greece, the capital of the nome of Trikala in northwestern Thessaly, situated 38 miles west of Larissa, with which it has railroad connection by way of the Gulf of Volos. The chief industries are tanning, dyeing, and the manufacture of cotton and woolen goods. The ancient town, Trikka, had a famous temple of Æsculapius. Pop. (1896) 21,149.

Trikoupis, Charilaos, Greek statesman, son of Spiridion Trikoupis (q.v.): b. Nauplia 23 July 1832; d. Cannes, France, 11 April 1896. He inherited his father's literary bent of mind and later began the study of jurisprudence in Athens, afterward studying and completing his course at Paris. His mind then turned toward diplomacy and in 1852 he entered the service of his country as attaché to the legation in London, and in 1863 was promoted *chargé d'affaires*. In 1865 he was in charge of the negotiations with England which brought about the cession of the Ionian Islands. He was elected to the Boulé the latter part of the same year, and joining the Radical party became successively minister of foreign affairs in 1866, premier in 1875, and again in 1877 minister of foreign affairs in the coalition ministry under Canaris. He then again became premier in 1878–80, and served also the terms 1882–5, 1886–90, 1891–3, and 1893–5, but at the next election he was defeated and even lost his seat in the Boulé. This was probably due to the low state of the finances of the government, which he had in vain attempted to raise

to a degree of stability through the imposition of tariffs and the enactment of agrarian laws as well as by the building of railways. Public confidence in his administrative ability was, however, once more shown by his re-election from the district of Valtos, but he was at the time sick and died before taking his seat. His speeches, *Λόγοι πολιτικοί*, were published in one volume at Athens in 1888.

Trikoupis, trē-koo'pĭs, **Spiridion,** Greek statesman and man of letters: b. Missolonghi, 20 April 1788; d. Athens 24 Feb. 1873. After completing his education at Paris and London he became private secretary to Lord Guilford at Corfu. In 1821, upon the outbreak of the Greek insurrection, he returned to Missolonghi and joined the patriots. Throughout much of his life he was engaged either in administrative or diplomatic affairs. From 1833–41 he was minister to England, and after 1843 he held in succession the portfolios of the ministry of foreign affairs and of public instruction, the vice-presidency of the Senate, and the post of envoy extraordinary to France. As a man of letters he was among the greatest names of modern Greece. Most celebrated of his works was the oration pronounced on Lord Byron, his friend and associate, at the cathedral of Missolonghi. His 'Poeme des Kliphtes' (1820) is well known, as is also his 'Histoire de la révolution grecque' (1853–7).

Tril'by, a novel by George Du Maurier, so named for its principal figure, and published in 1894. It is a story of artist life in the Latin Quarter of Paris. It achieved a great and sudden popularity and was very soon dramatized. Trilby, the heroine, is a laundress and artist's model and her relations with three artists, Taffy, the Laird, and Little Billee, form the theme.

Tri'lithon, a monument, probably sepulchral, either standing alone or forming part of a larger work, and consisting of three stones; two uprights, connected by a continuous impost or architrave. Among the best-known examples of trilithons are those at Stonehenge, on Salisbury Plain, England. In the trilithons still standing, each of the uprights has a tenon on its surface, and the under sides of the architrave or horizontal piece have each two mortises into which the tenons fit. Similar monuments are found in Scandinavia over the graves of the distinguished dead.

Trillium, a genus of the *Liliales*, monocotyledonous plants, having all the parts in threes, to which circumstance the generic name refers. They are handsome plants, known also as wake-robin, native to North America and Asia. The leaves are triple, in a single whorl, the flower-peduncles arising from the centre. The three petals of the flowers alternate with the same number of sepals. The fruits are large berries, dark red or purple in color, and sometimes angled. They are early blooming smooth perennials, with perpendicular rhizomes ending abruptly and abounding in starch. *Trillium grandiflorum*, which extends from Quebec to Florida and westward, in cool, damp woods, has rhombic, ovate and pointed leaves. The petals are somewhat spreading, pure white or touched with pink, when aged turning to old-rose tints. The painted trillium (*T. undulatum*) is very small, with white petals, narrow and wavy-margined, and veined with purple. *T. cernuum* has a white-petaled flower nodding on a recurved stalk quite under the leaves, which are broadly rhombic. Other species have green flowers, as *T. viride* and *T. recurvatum*, the latter distinguishable by its reflexed sepals. Two, at least, are purple-flowered, the blossom of one being sessile (*T. sessile*), and the other (*T. erectum*) having declined flower-stems and reddish-purple petals, somewhat acute, and a little longer than the lanceolate sepals. These have a most disagreeable odor, probably attractive to carrion flies, however, and are among the first plants to bloom in the shady, cool woods of eastern America. They are called beth-root or birth-wort, and have a rhizome of sweetish, astringent, acrid taste, and emetic properties.

Tri'lobite, in palæontology, any individual of the order *Trilobita*, so called from the division of the external skeleton into three regions: (1) a cephalic shield; (2) a variable number of body rings; and (3) a caudal shield, tail, or pygidium. The cephalic shield is usually more or less semicircular, with an elevated portion, the glabella, bounded by the fixed cheeks, to which the free cheeks which bear the eye are attached by the facial suture. The posterior (genal) angles of the free cheek are commonly prolonged into longer or shorter spines. The eyes are sessile, compound, and consist of an aggregation of facets, covered by a thin cornea. The number varies greatly, Barrande having found as few as 14 and as many as 15,000 facets in each eye in different types. Behind the cephalic shield comes the thorax, composed of a number of segments (2 to 26), capable of more or less movement on each other; in several genera this freedom of movement was so great that species could roll themselves up into a ball, like a hedgehog. The tail is also composed of a number of segments (from 2 in *Sao hirsuta* to 28 in the genus *Amphion*), ankylosed or amalgamated. The extremity is sometimes rounded, but may be prolonged into a spine, and the ends of the pleuræ of the tail-segments may also be produced into spine-like processes. With regard to the under-surface and appendages of the trilobites much remains to be discovered. The head bears a hypostome or plate in front of the mouth and four pairs of jointed appendages, the basal parts of which were modified to serve as jaws.

From Walcott's examination of sections of rolled-up specimens, it appears that the thoracic appendages were slender, five-jointed legs, in which the terminal segment formed a pointed claw, and the basal segment carried a jointed appendage, homologous with the epipodite of many recent crustaceans. On each side of the thoracic cavity was attached a row of bifid, spiral branchial appendages, and appendages serving also as gills were probably attached to the bases of the thoracic limbs.

Trilobites vary greatly in size, some being scarcely larger than a pin's head, while species of *Asaphus* have been met with two feet in length. They appear to have lived on muddy bottoms in shallow water, feeding on small marine animals, and probably swam on their backs, as do the recent *Apus* and the larval forms of *Limulus*. The general opinion of zoologists at the present time is that they are

related, through the *Xiphosura* and *Limulus*, to the *Arachnida*, and are not crustaceans as formerly believed. Trilobites are characteristic of the Palæozoic system or rocks, and reached their maximum development in the Ordovician. The genera are numerous.

Consult: Zittel and Eastman, 'Text-book of Palæontology'; Walcott, 'Bulletin Museum Comparative Zoology' (Cambridge 1881).

Tril'ogy, among the ancient Greeks, a union of three tragedies, connected in subject, which, together with a satirical piece, were performed in immediate succession. There is only one trilogy of antiquity which we can be certain of possessing complete, namely, the 'Orestias' of Æschylus, which contains the 'Agamemnon,' 'Choëphori,' and 'Eumenides.'

Trimble, trĭm'bl, **Isaac Ridgeway**, American soldier: b. Culpeper County, Va., 15 May 1802; d. Baltimore, Md., 2 Jan. 1888. He was graduated from West Point in 1822, engaged in surveying military roads under the government in 1822–32, and then resigned to pursue the profession of civil engineering. He was afterward engaged as chief engineer on different railroads and at the outbreak of the Civil War joined the Confederate army. He was appointed colonel of engineers in 1861, had charge of the construction of defenses of Norfolk, Va., and later built the batteries at Evansport on the Potomac. He chose the position for the Confederate forces at Cross Keys, 8 June 1862, was engaged at Gaines' Mills, Slaughter Mountain, and at Manassas, and in 1863 was promoted major-general. He took part in the charge of Pickett's division at Gettysburg, where he lost a leg and was taken prisoner. He was exchanged in April 1865 and reached Lynchburg on his way to rejoin Lee, the day after the surrender at Appomattox.

Trimble, Robert, American jurist: b. Berkeley County, Va., 1777; d. 25 Aug. 1828. He removed with his parents to Kentucky in 1831, and there gained with little instruction sufficient education to enable him to teach. He later studied law, was admitted to the bar in 1803 and in that year settled at Paris, Ky., where he engaged in law practice. He was soon afterward chosen to the legislature, was appointed second judge of the court of appeals in 1808, and chief justice of Kentucky in 1810. He was United States district attorney in 1813, served as district judge of Kentucky in 1816–26, and from 1826 until his death was a justice of the United States Supreme Court.

Trimeth"ylam'ine, $N(CH_3)_3$, an organic chemical compound found in very small quantity in various plants, hawthorn, wild cherry, pear, etc., but contained in considerable amount in herring brine, where it is the result of the decomposition of organic substances containing nitrogen. Obtained usually by the action of heat upon the "vinasses" or residues from the refinery of beet sugar. It can be made in the laboratory by action of methyl iodide upon ammonia. A liquid boiling at 9° to 10° C., soluble in water and possessing a very strong ammoniacal and fishy odor. Its chemical behavior is like ammonia in that its water solution is a strong base which unites with acids to form salts. It may be considered as ammonia NH_3 in which the three hydrogen atoms have been replaced by three methyl (CH_3) groups. The methylamine hydrochloride is used extensively in place of ammonium chloride in the Solvay process for manufacture of potassium carbonate. See Solvay Process.

Trimurti, trĭ-moor'tĭ, in the religious system of latter Brahmanism, the Hindu trinity, Brahma, Vishnu, and Siva, considered as an inseparable unity. The sectaries of Brahma, Vishnu, and Siva respectively make their god the original unity from which the trinity emanates; but considered separately, Brahma is the creating, Vishnu the preserving, and Siva the destroying principle of the deity, while Trimūrti is the theological or philosophical unity, which combines these separate forms in one self-existent being. (See Brahma, Siva, and Vishnu). The Trimūrti is represented symbolically as one body with three heads, Vishnu at the right, Siva at the left, and Brahma in the middle, holding the receptable for alms, and wearing the crown of roses.

Trincomali, trĭng"kō-ma-lē', or **Trikonamalai**, Ceylon, a town situated on Trincomali Bay on the northern part of the east coast. The bay forms a safe harbor of refuge, and is defended by strong fortifications. Pop. (1901) 11,793.

Trine, Ralph Waldo, American writer on character building: b. Mount Morris, Ill., 9 Sept. 1866. He was graduated from Knox College, Galesburg, Ill., in 1891, and has published several popular booklets, including 'What All the World's a-Seeking'; 'In Tune With the Infinite'; 'The Greatest Thing Ever Known' (1898); 'Every Living Creature' (1899); etc.

Trine Immersion, the name given to the practice in the primitive Church of dipping a person who was being baptized three times beneath the surface of the water, at the naming of the Three Persons of the Holy Trinity. See Baptism; Baptists.

Trinidad, Colo., city and county-seat of Las Animas County; situated in the extreme southern part of the State, 50 miles east of the Continental Divide; on the Atchison, T. & S. F. and the Denver & R. G. R.R.'s. It was first settled in 1853 by Mexican ranchers; became a town under territorial law in 1872; and a city in 1877. Trinidad is situated in a coal-mining and agricultural region, and derives its business chiefly from mining and trade in agricultural products; there are also railroad shops and a wool-scouring mill; and three banks with a combined capital of $275,000. It contains a Carnegie public library, four public schools, including a high school, a business college, St. Joseph's Academy, and the San Rafael Hospital. The government is vested in a mayor and a board of aldermen of 10 members, elected bi-annually; the waterworks are under municipal ownership. Pop. (1890) 5,523; (1900) 5,345.

Fred Chase,
Secretary of the Chamber of Commerce.

Trinidad, Sp. trē-nē-thäth', Cuba, city, province of Santa Clara; four miles from the southern coast; 40 miles southeast of Cienfuegos. It was founded by Diego Velasquez in 1513. It is connected by railroad with its port, Casilda, and carries on a considerable trade; coffee was formerly its most important export.

but the export of sugar is now increasing. It is well situated on high ground, and is one of the most healthful cities on the island. Pop. of the municipal district (1899) 24,271.

Trinidad, West Indies; among the British islands in that archipelago the second in size and number of inhabitants; area 1,754 square miles and population 255,148. It lies just above lat. 10° N., so near to the coast of Venezuela, and in respect to fauna, flora, and geological formation so closely identified with South America, that, as has been well said, it "is merely a severed fragment of the mainland, having exactly the same relations to it that Long Island has to the adjacent coast of New York and New England." Its mountain ranges are not volcanic (like those which formed the Caribbees, stretching away toward the north), but exemplify the east-and-west trend which is found also in adjacent parts of South America and in the Great Antilles. The Gulf of Paria, enclosed between Trinidad and the Venezuelan coast, has two narrow outlets, *la Boca de la Sierpe* (the Mouth of the Serpent) on the south, and *la Boca del Dragón* (the Mouth of the Dragon) on the north — both names bestowed by Columbus. (Compare 'Scritti di Cristoforo Colombo,' edited by Cesare de Lollis, Rome 1894.) Nearer the latter than the former, and overlooking the gulf from hills several hundred feet above sea-level, is Port of Spain, the capital of the island: a city of 54,100 inhabitants, celebrated for its views, cool breezes, and good climate — though in 1903 its hospitals were crowded with patients suffering from an infectious disease.

More than one third of the inhabitants of the island are East Indian coolies; even more numerous are the negroes and mulattoes, the latter of mixed African, Spanish, French, and English blood; there is a small English element, and the commerce of the ports attracts a few Venezuelans, Portuguese, etc. The number of East Indians was given in 1901–3 as 86,357; it was estimated at 98,000 in 1897–8 by Mr. Hill, in whose work, 'Cuba and Porto Rico, with the Other Islands of the West Indies,' appears the following account: "They are brought from Hindustan, under contract, at the expense of the colony, and under care of the government agents. They are apprenticed to owners for five years. . . . They dwell by themselves in little huts of a peculiar type, and maintain their own dress, priests, and religious ceremonials. Rice, cassava-roots, and fruits supply their scanty meals. They are bound by law to work nine hours a day for 280 days in the year, and receive a regular rate of wages, usually less than sixpence a day. The law concerning this apprenticed larbor is very strongly enforced both upon the coolie and his employer. Each estate employing coolies is obliged to provide hospitals under the inspection of medical visitors, and all the labor arrangements are subject to the inspection of government agents, who visit the estates constantly and report each week to the agent-general of immigrants; he in turn reports to the governor, who has absolute authority to cancel the contract and remove any and all coolies from an estate. When the time of indenture is ended the coolie is entitled to transportation back to his native land. In lieu thereof he can make a new contract for a year, or he can remain and work wherever he chooses, and receive the amount of his return passage in cash. . . . Low as their wages are, most of them accumulate considerable sums, which are often converted into silver bracelets and bangles for the arms and ankles of their women, who thus preserve the family treasure." The various forms of agriculture are shown in recent statistics of the areas devoted to each, namely, to cacao 190,800 acres; sugarcane 52,000 acres; ground provisions 34,500 acres; pasture 15,200 acres; cocoanuts 14,000; and coffee 4,000 acres.

The average annual values of exports and imports, based upon statistics of the years 1899–1901, inclusive, are: exports from the island $12,671,815, and imports $12,813,040. But bullion and specie are included in both of these total amounts; furthermore, as stated by the collector of customs at Port of Spain, "The great bulk of the Orinoco trade is done through Trinidad. There cargo is transfered to or from river steamers having a draft of about 10 feet. These are able, without leaving smooth water, to enter the Macareo, and by that channel to reach Ciudad Bolivar, which is about 300 miles from Port of Spain." (Compare Bulletin, Sept. 1903, Bureau of American Republics.) In other words, Port of Spain is the place of reshipment in the foreign trade of Venezuela. Among the articles exported from Trinidad in 1901 were: cocoa, valued at $4,771,455; sugar, $2,261,050; and asphalt, $798,165. The asphalt, largely used as material for pavements in the United States, is obtained from the so-called "asphalt lake," which is situated about 60 miles south of Port of Spain. This "lake," covering nearly 100 acres, "has a black surface, with inky pools of soft bitumen and spots of yellow bubbles and water-cracks. The surface is yielding and a strong odor of sulphuretted hydrogen prevails. Anything more black and repulsive can hardly be imagined. It has been likened to a vast asphalt pavement with many holes filled with inky waters in which swim ugly fish and black beetles. When pieces of pitch are taken from the lake, nature at once begins to repair the damage, and in 24 hours the hole is filled again." (Compare Hill, page 369.) The island's chief imports in 1901 were: textiles, valued at $1,930,000; machinery and hardware, $1,012,020; flour, $893,350; and rice, $581,400. The annual average revenue of Trinidad and Tobago for the years 1899, 1900, and 1901–2 was $3,375,670, and their annual average expenditure during the same period, $3,370,200. Items of the expenditure in the fiscal year 1901–2 were: public works, $748,810; debt charges, $253,115; police, $236,490. The public debt in 1902 was $4,961,430.

Trinidad and the adjacent island of Tobago (area of the latter 114 square miles) are administered together as a British colony, having a governor (salary $25,000), executive council of six members, and legislative council of 22 members, all nominated. The annual appropriation for the support of the schools (237 public schools, with 30,706 pupils) is about $194,175. There are many private schools, and two colleges (the Queen's Royal and attached Roman Catholic). The distribution of the Christian population in Trinidad and Tobago is: Roman Catholics, 89,213; Church of England, 72,920; other denominations, 29,967. There are 81⅛ miles of railway; 1,147 miles of telegraph and telephone;

and lines of steamships connecting the island with England, North America, Holland, and Venezuela. The police force numbers 567 men. Police volunteers and special constables are readily secured for service in emergencies, as was proved on 23 March 1903, when a riot occurred in the streets of the capital as a result of general disapprobation of the methods of the government, the special cause of complaint being an onerous water-tax. Banks are: The Colonial; a branch of the Union Bank of Halifax; and the Government Savings Bank.

To the aborigines (probably of the Carib stock), their island was known as Iére, a word signifying "Land of Humming-birds"; it received the name which it now bears in July 1498, when Columbus, in the course of his third voyage, was drawing near to the coast of South America. His son Ferdinand Columbus writes: "One day about noon as he was thus sailing, Alonso Perez Nirando, a sailor of the town of Huelva, while going up to the round-top, saw the peaks of three mountains to the westward, distant about 15 leagues. Not long afterward they beheld land extending northeastwardly as far as they could see. When they had given thanks to God and said the *Salve Regina* and other prayers used by seamen in times of distress or joy, the admiral called the discovered island, la Isla de la Trinidad [the Island of the Trinity], for he had thought of giving that name to the first land they should find on the voyage, and now God had graciously granted him the sight of *three mountains* near together as has been mentioned." In the letter from Christopher Columbus to the king and queen, describing his third voyage, this beautiful incident is narrated, the details being substantially the same, but their grouping less effective. The island has further interesting historical association with the successful expedition of Cortes to Mexico and the disastrous undertaking of Sir Walter Raleigh in Guiana (q.v.). Robert Dudley, Earl of Leicester, in 1594 explored Trinidad, and on his return to England wrote the appreciative description of it which appears in his brief account of the voyage. (See WEST INDIES.) From the date of his visit to the end of the 18th century, Spain, France, and England contended for the possession of the island, and each in turn held it for a while: some of the ethnological consequences have been mentioned above. The indigenes of the "Island of Humming-birds" vanished long ago from the scene; the present inhabitants of the "Island of the Trinity" are Africans, and non-Christian East Indians, with the proportion of white people of pure blood practically unchanged in the passing centuries.

MARRION WILCOX,
Authority on Latin-America.

Trinita'rian, one who believes in the doctrine of the Trinity, the union of three persons, Father, Son and Holy Spirit, in one Godhead. The received doctrine of the Christian Church among Trinitarians holds that it is taught in the Scriptures that there is but one God, and yet that there are three equal subjects in the one Godhead, who are described as persons, but that we can not determine in what sense these three are separate and in what sense they are united in one. The incorporation of the doctrine of the Trinity in the creeds of Christendom is the result of the attempts to reconcile two seemingly conflicting teachings of the Bible, the first that the Father, Son and Holy Spirit each possess the divine attributes, and is worthy to be worshipped, and the second that there is but one God, and that polytheism is sinful.

Under the name Trinitarians, a monastic order (see ORDERS, RELIGIOUS) was founded in the year 1197 by Pope Innocent III. for the ransom of Christians captured by the Moors and the Saracens. John de Matha (d. 1213) and Felix de Valois (d. 1212) were the leaders of the order, the former becoming its first general and the latter its first abbot. By 1200 A.D. 200 Christians had been redeemed out of slavery in Morocco by the Trinitarians and the society spread rapidly in France, Italy, and Spain. Aided by Honorius III. and Clement IV., it afterward spread into Portugal, the United Kingdom, all of south-central Europe and finally to America. From the character of the work done by the order its members came to be known as Redemptionists, and in France by the middle of the 17th century there had been 246 redemptions, releasing 30,720 prisoners, while the numbers for Castile and Leon were 362 redemptions and 11,809. By the 18th century the order possessed over 300 houses, but it was rapidly nearing its end, which came in the latter half of that century; it is now almost extinct, having outlived its usefulness.

Trin'ity, (1) A river which has its rise in Trinity County, in the northeastern part of California. It flows into the Klamath River in Humboldt County. Its length is about 130 miles. (2) A river in Texas which has its rise in the northern part of the State. It is formed by the union of two rivers, the East and West Fork. It flows east and southeast, and enters Trinity Bay, an arm of the Gulf of Mexico. The total length is 560 miles. At high water it is navigable for small boats a distance of 500 miles. It flows through a rich agricultural country.

Trinity Bay, Newfoundland, a large, irregular bay on the southeast coast, cutting off, together with Placentia Bay, the peninsula of Avalon from the main part of the island. Its chief port is Heart's Content.

Trinity College, located at Hartford, Conn. It was founded by Bishop Brownell of the Protestant Episcopal Church in 1823; and was then chartered as Washington College. In 1831 the name was changed to Trinity College; in 1872 the original campus was sold to the city of Hartford as the site for the State capitol, and the college moved to its present site. The college offers the following courses: (1) a course in arts leading to the degree of A.B., (2) a course in letters and science leading to the degree of B.S., (3) a course in science, leading to the degree of B.S., (4) a course in letters, leading to the degree of B.L., (5) a course in civil engineering, added to the curriculum in 1903–4, three years in length; those taking this course may receive either the degree of A.B. or B.S., according to their electives. The College has a large number of scholarships, one fellowship, and a graduate scholarship. Among the buildings are the Saint John Observatory, Boardman Hall (natural history building) and the Gymnasium and Alumni Hall. The library in 1904 contained 46,000 volumes; the productive funds amounted to $850,000; the students numbered 125, and the faculty 20.

Trinity College, Cambridge, England; founded by Henry VIII., in 1546 on the site and out of the revenues of Michael-house (1324), King's Hall (1337), and other ancient societies, is the largest college of the university. To the 60 fellowships and scholarships of the foundation Queen Mary added 20 scholarships. The scholarships, which are tenable up to the M.A. degree, have a yearly value of from $150 to $500, the sizarships of about $350, and there are further three annual minor scholarships of $350 and three of $250, tenable for three years, besides 16 exhibitions for scholars from Westminster, St. Paul's, Lynn, Shrewsbury, etc., and numerous prizes. The fellows, with certain exceptions, must take holy orders within seven years after their M.A., and the college may elect professors or other distinguished literary or scientific men to regular or honorary fellowships. Trinity is more conspicuous for the extent than the special architectural beauty of its buildings. Noteworthy, however, are Nevill's Fountain, the three great gateways by which the three chief courts are entered, the Gothic Hall with its high-peaked roof, the chapel (re-decorated 1875), the library designed by Wren, and containing nearly 100,000 volumes, the Master's Lodge, with its state rooms, where royalty and the judges are received, and the rich collection of busts and statues of former members — of Newton, by Roubillac, Porson by Chantrey, Byron by Thorwaldsen, Barrow, Macaulay, Whewell, Sedgwick, Tennyson, etc.

Trinity College, Oxford, England, was founded by Richard de Hoton, prior of Durham, in 1290, for the education of the student monks of Durham. It was rebuilt and improved by Sir Thomas Pope in 1554, and after Balliol was the first college re-endowed by a layman, and further remarkable in view of the Reformation, as being like Saint John's, indebted for this to a Roman Catholic. The faculty consists of a president, 12 fellows, several honorary fellows and lecturers. There are 21 scholarships, nine exhibitions, and the average annual attendance of undergraduates is about 200. The college has in its gifts ten church livings. The buildings surround a fine quadrangle, and include a Renaissance chapel, built in 1694 in which is a fine altar-piece, and a beautiful carved screen. Among the distinguished alumni are Sheldon, Ludlow, Ireton, Newman, Pitt, North, Stubbs, Rawlinson, and Bryce.

Trinity College, or **The University of Dublin,** Ireland, is said to have been founded by Queen Elizabeth in 1591. Some authorities, however, assert that she merely endowed and Protestantized the school and that its establishment was due to Alexander Bigner or Bignor, an ecclesiastic of the 13th century. It is the largest and most important educational institution in Ireland and has extensive buildings which enclose several quadrangles. Corinthian columns ornament the principal front, the chapel has a Corinthian portico and the decorations of the fine library are also Corinthian. See DUBLIN, UNIVERSITY OF.

Trinity College, located at Durham, N. C. It was founded as a school of secondary grade in 1838, and was then located in Randolph County; in 1851 it became a normal college, and the next year established a full college course and was granted power to confer degrees. In 1857 it was placed under the control of the North Carolina Conference of the Methodist Episcopal Church, South, and in 1859 the name was changed to Trinity College. During the Civil War the college was compelled to close; and was reopened in 1866. In 1891 it was moved to its present site in Durham. Women were admitted to all privileges of the college in 1896. The college offers three groups of studies, all leading to the degree of A.B., the first group requires Latin and Greek in the first two years, the second group substitutes French or German for Greek, and the third group is for students intending to do advanced work in mechanical, electrical or civil engineering; the work of the last three years is partially elective. Provision is also made for graduate work for which the degree of A.M. is conferred. There are 50 scholarships, and two loan funds for the aid of poor students; tuition is free for those studying for the ministry. The grounds, consisting of 73½ acres, are known as Trinity College Park, and are under the municipal government of Durham; the buildings include the Washington Duke Building, the Crowell Science Building, the Epworth Building, the Mary Duke Building, the Craven Memorial Hall, the Angier Duke Gymnasium, a dormitory (erected 1902) and the library (completed 1903). The productive funds in 1904 amounted to $429,000; the students numbered 375, and the faculty 23.

Trinity College, a Roman Catholic institution for the higher education of women, located at Washington, D. C. It was founded by the Sisters of Notre Dame (Namur), and was first opened to students in 1900. It offers two college courses leading to the degrees of A.B. and B.L. respectively; and has no preparatory department. The library in 1903 contained over 5,000 volumes; the income amounted to $25,000; the students numbered 51.

Trinity, Doctrine of the, the Christian doctrine of the triune nature of God. The doctrine of the Trinity is nowhere expressly taught in the Old Testament. The doctrine in regard to the divine nature which is most strongly insisted on throughout the Old Testament is the unity of God as opposed to polytheism, and by the names by which God revealed himself to Moses (Ex. iii. 14, 15, and other passages) it is implied that the divine nature is inscrutable to human intelligence. The plural form used to designate the Deity in the account of the creation, and many other incidental circumstances or expressions, are, however, held as implying, if not teaching, this doctrine.

In the New Testament it is evident that the doctrine of a Trinity in the divine nature is clearly and copiously taught. In the Gospels Christ himself asserts a mysterious union between himself and the Father, appropriates to himself by an evident allusion the mysterious name of God revealed to Moses, and repeatedly refers to the Holy Spirit along with the Father as partaking of the same divine nature and union. The same doctrine is implied in the teaching of John, the forerunner. In the baptism of Christ by him the Holy Spirit is represented as descending visibly upon him while he is recognized by an audible voice from the Father, and in the rite of baptism instituted by Christ the names of

Father, Son, and Holy Ghost are used as the joint designation of the divine being. The apostles and other writers of the New Testament Epistles constantly employ this form both in the introductory assertion of their authority and in their closing benedictions.

Among the definitions which resulted from the conflict of opinion in the early Church with regard to the doctrine of the Trinity, that which was adopted by the Catholic Church, and is generally accepted by orthodox Christians, fairly claims the merit of the fullest harmony and most comprehensive consistency with the various statements of Scripture. It is that three are in the Godhead three persons, one in substance, co-eternal, equal in power, the Father, Son, and Holy Ghost. It was only, however, after a severe and protracted conflict that this definition came to be generally accepted, and as soon as the definition proceeds one step further a wide schism again separates the Church. The Eastern Church holds that the Holy Ghost proceeds from the Father; the Western, throughout all its divisions, adopting the amended form of the Nicene Creed, holds that he proceeds from the Father and the Son. The three creeds commonly called the Apostles', the Athanasian, and the Nicene, all contain the points of agreement between the two divisions of the Church, while on the point of difference the Athanasian and the commonly known form of the Nicene express the faith of the Western Church. The word «Trinity» is not in Scripture. The term persons is not applied in Scripture to the Trinity, but something analogous to the conception of personality seems to be implied in the apostolical arguments of the epistles. See ARIANS; NICE, COUNCILS OF; NICENE; CREED UNITARIANS.

Trinity University, situated at Toronto, Canada, and since 1903 in federation with the University of Toronto. The University was founded by Royal Charter in 1852, and at that time was organized with the faculties of Arts, Divinity, and Medicine, the latter two having been previously established independently. Since that time all courses of the University have been opened to women, and Saint Hilda's College, the residential building for women, erected. New departments have also been added and the faculty of Medicine reorganized until at the time of the federation with the University of Toronto the organization of Trinity, with its affiliated schools, included Trinity College (the Faculty of Arts), Saint Hilda's, College, the Faculty of Divinity, the Faculty of Law, Trinity Medical College, the Ontario Medical College for Women, the Toronto Conservatory of Music, the College of Pharmacy, and the Dental College. The federation of Trinity and Toronto was legalized by the proclamation of the Lieutenant-Governor-in-Council, 28 Nov. 1903, and took effect 1 Oct. 1904. The distinctive feature of Trinity in comparison with the other schools included in the University of Toronto is its provision of residential buildings for students in the Arts Department; in this it has been modelled after the English universities of Oxford and Cambridge. There are also certain courses in religious subjects in the regular Arts course; some of which are prescribed for only such students as are members of the Church of England. See also TORONTO, UNIVERSITY OF.

Triple Alliance The, or **Dreibund,** drī'boond, a defensive alliance between Germany, Austria-Hungary and Italy, which continues, under the existing pact, until May, 1909. In 1873, the German emperor, the emperor of Austria and the Czar of Russia entered into a mutual understanding known as the Dreikaiserbund, for the preservation of peace in Europe. It was not an alliance, but a friendly agreement between the sovereigns. It caused the first German emperor, however, to hesitate to enter into any new arrangement which might seem at variance with the understanding in question, until the growing cordiality between France and Russia made Germany apprehensive as to the future. In 1879 a dual alliance was effected between Germany and Austria-Hungary, Prince Bismarck acting in behalf of Germany, and Count Andrassy for Austria-Hungary. The terms of the alliance bound each of the contracting powers to come to the assistance of the other with its military and naval forces, in case of an attack from two sides, such as an attack by Russia and France on Germany, or by Russia and Italy on Austria-Hungary. Italy was under obligations to Germany for the results of the war of 1866, which established Italian unity, but had causes of difference with Austria on account of the territory, chiefly Italian as to its people, still held under Austrian dominion. The latter influence was at last outweighed by jealousy and distrust of France, when the French seized Tunis, and gave evidence of intent to further extend their possessions in North Africa, which the Italians regarded as a field for Italian expansion. In 1883, therefore, Italy joined Germany and Austria in what has since been known as the Triple Alliance. Although the general purpose of the Triple Alliance has been set forth by the statesmen of the countries interested, the exact terms have been kept secret. It is understood, however, that Italy is to be assisted by Germany and Austria in resisting any aggression by France, and must send troops to the aid of Germany and Austria, or either of those powers, should they be invaded by France or Russia or both. The alliance would have terminated in May, 1903, by lapse of the period agreed upon, and much doubt was felt as to whether Italy would consent to a renewal. The relations between France and Italy had become more amicable, France agreeing not to stand in the way of Italian aspirations in the direction of Tripoli, and Italy being willing that France should have a free hand in Morocco.

The dual alliances between France and Russia, and England and Japan, and apprehension that Italy might come to a closer understanding with France, made Germany anxious to renew the Triple Alliance as a guaranty of German security and European peace. Inducements were offered to Italy in the form of more favorable treatment for her commercial products, and it is supposed, although not stated on authority of the statesmen of either country, that Italy was told that she might curtail her military expenses.

The influences in favor of renewal prevailed, and a new treaty was signed at Berlin, 26 June 1902, which prolonged the Triple Alliance in its original form for a further period of six years.

Trip'ler, Charles Eastman, American inventor: b. New York 10 Aug. 1849. Early in

life he became an expert mechanician, and in 1871 constructed several models of canal boats propelled by their own motive power. In 1872 he was engaged on a naphtha engine to be used in launches, its principle being the recondensation of naphtha so that it could be used over and over. Experiments in the field where he has since become distinguished were also begun at this time. In the early part of 1890 he made his first regenerative coil, and he shortly discovered principles hitherto unutilized in the process of liquefying air. His inventions and rights are controlled by the Tripler Company.

Triplet, in music, a combination of three notes to be played in the time of two. They are joined by a slur and distinguished by having the figure 3 above them.

Tri'pod. This name, signifying generally any three-legged utensil, came to be applied to a bronze altar consisting of a caldron raised on a three-legged stand of bronze. Such was the altar of Apollo at Delphi. It had a round flat plate on the top, on which the priestess sat when giving responses. Tripods of fine workmanship and of precious metal were placed in later times as votive gifts in the temples, especially those of Apollo (q.v.).

Tripoli, Tripolis, or **Tarabulus,** a town in Syria, Asiatic Turkey, in the vilayet of Beirut, about 40 miles north-northeast of the city of Beirut and two and a half miles from El-Mina, its port of entry. It is situated at the foot of a spur of Mount Lebanon and at the mouth of the Kadisha. The ancient town was situated on a triangular promontory jutting out into the Mediterranean Sea, and for several centuries continued to occupy that position. Earthquakes destroyed a greater portion of the town in 450 and again in 550; in 638 it was captured by the Saracens; it became an important stronghold at the time of the Crusades, and in 1108 was captured by the Crusaders, after having successfully withstood a siege lasting several years. At that time a large and valuable library was burned. It was destroyed by the Egyptian Sultan, Kalaun, in 1289, but soon afterwards the town was rebuilt on its present site and now enjoys considerable prosperity. In May 1864 the government powder magazine exploded, destroying a large portion of the town and 300 or 400 lives. Among the buildings are a custom-house, foreign consulates, churches, a synagogue, several mosques, an American mission station and girls' school, an orphanage and girls' home of the French Sisters of Charity, a monastery, and an old castle standing on an adjacent height. The main source of income is derived from the export of raw silk, sponges, ivory, sugar-cane, olive-oil, cotton, wool, ostrich feathers, tobacco, galls, cochineal, soap, etc. Population about 30,000, mostly Mussulmans.

Tripoli, or **Tarabulus,** North Africa, the capital of the Turkish vilayet of Tripoli, situated on the Mediterranean coast, 100 miles from the boundary of Tunis. It lies in a fertile region, is surrounded with a wall, with its domes and slender minarets, has a pleasing aspect. It is a clean and comparatively well built city, with a handsome palace of the bey, good caravansaries, public baths, numerous mosques and two Christian churches. There are manufactures of carpets and cloths and a considerable caravan trade over Sahara. Pop. (1900) 30,000.

Tripoli, North Africa, a Turkish province or vilayet, forming one of the Barbary powers, situated along the Mediterranean coast from Egypt to Tunis, and extending inland from 60 to 600 miles to the Libyan Desert and French Sahara. It consists of Tripoli proper, the semi-detached district of Barca or Benghazi in the northeast and the oasis district of Fezzan in the south; and is bounded on the north by the Mediterranean Sea, on the south by the Sahara, on the east and southeast by the Libyan Desert and on the west by Tunis. The total area of Tripoli and its dependencies is about 398,900 square miles.

Topography.— There are practically no harbors of any importance with the exception of Tripoli, the capital city, as the coast line stretches for over 700 miles in an irregular line and is almost unbroken by protecting headlands or indented with bays. The eastern half forms the Syrtis Major or Gulf of Sidra and is broken by numerous rocky points, which are, however, of insufficient size to form harbors; the western half, extending from the Gulf of Cabes, or Lesser Syrtis, east to Mesurata Point, is low and sandy. The greater portion of the interior, even up to the Mediterranean shores, is a desert country consisting of sandy plains or naked mountains and plateaus. Two mountain ranges stretch from west to east, running nearly parallel to the coast, to the south the Suara Mountains and to the north the Gharian Mountains, the latter about 20 miles from the coast, having a width of from 12 to 15 miles and consisting for the most part of volcanic rocks and isolated peaks. In the southwestern and southern parts of Tripoli proper is the Hammada-el-Homra, an interminable stony tableland covering about 40,000 square miles and about 1,500 feet above sea-level, south of which is the Fezzan depression, in the oasis of which dwell tribes nominally subject to Tripoli, but practically independent. The eastern part of the country (Barca) is practically a continuation of the desert in the south, the mountains to the north being a continuation of the two ranges in Tripoli proper.

Fezzan.— This province covers an area of about 150,200 square miles. In the northern part are low mountains or hills and sandy plains and a few fertile valleys are in the southern part. To the south, especially in the district surrounding the capital, Muzruk, are numerous oases, which, together with the Valley of Wady Lajâl, form the most fertile section of Fezzan, corn and dates being cultivated in large quantities. The most common animals found in the hills are foxes, jackals, gazelles, the ostrich, vulture and falcon. There are no streams of water and but a few natural springs and small lakes, the rainfalls being very slight and with long periods intervening.

Barca.— To the western and northern parts of this province, which is about 500 miles long by 400 miles wide, is the elevated plateau of Cyrenaica, which encloses the Gulf of Sidra and which is separated on the south from the Libyan Desert by the Aujila depression, a remarkable chain of low-lying oases. South of this depression the land gradually rises to a height of 1,200 feet and then again depresses to the level of the desert. The sides and summits of the hills in

the east and north are well cultivated and afford excellent pasture.

Climate.— The climate is dry and warm, but healthful, droughts prevailing from May to September and rains from November to March.

Industries.— In the hilly districts a large portion of the land is left for grazing purposes and cattle-breeding has become an important branch of trade, but olives, figs, almonds and other fruits are cultivated to a considerable extent. The coast region in the extreme west, particularly the district of Mesheea, is a fertile fruit and cotton-raising district, the chief products of which are wheat, barley, millet, Indian corn, pomegranates, lemons, figs, jujubes, apricots, plums, watermelons, cotton, silk, tobacco, saffron, madder, and caster-oil; while from the interior come senna, dates and galls. Esparto-grass, barley and other grains, straw mats, earthen jars and other manufactures, beside the surplus products of the date and olive plantations, are exported by sea. The principal articles manufactured are carpets, cloaks, etc., sacking, prepared skins, morocco leather, earthenwares, etc. There is a considerable trade by caravan with the Sudan, carrying European goods south, and ivory, ostrich feathers, rubber and gold north. The total value of the commerce is about $5,000,000 annually.

Government and Population.— Tripoli is under the despotic rule of the Sultan of Turkey, who appoints the governor. The governor appoints beys, deys, or pashas, to control the government of the individual provinces into which Tripoli is divided. The revenues of the country are raised by direct tribute from the Arabs and district governors, a land tax, a tax on Jews and merchants, and export and import duties. The state religion is Mohammedanism and the official language is Arabic. The inhabitants are, with the exception of a few thousand Jews and Christians, practically all Mohammedans, Moors in the towns and nomadic Bedouins in the country. The population of Tripoli, including the dependencies, has been variously estimated at from 800,000 to 1,300,000.

History.— In ancient times Tripoli belonged successively to Carthage, Numidia and Rome. Later it passed into the hands of the Vandals and Greeks. It was captured in 644 by the Arabs, who turned the state religion from Christianity to Mohammedanism. The city of Tripoli was captured in 1510 by Ferdinand the Catholic and from 1530 to 1551 was under the control of the Knights of Saint John. In 1551 Tripoli became a Turkish province, then fell into a state of anarchy and remained a nest of pirates until in 1835 Turkey reasserted its authority and reduced what had been known as one of the "Barbary States" to a vilayet.

As a piratical stronghold Tripoli became involved with various European nations and finally with the United States. Both England and France sent expeditions against it in the latter part of the 18th century, and after numerous tributes and ransoms to insure peace had been paid by the United States to the "Barbary States" as a whole, a treaty with Tripoli was concluded in 1796 for peace without ransom. The pasha, however, inside of four years broke the treaty, demanding $225,000 and $25,000 annually, and on refusal of payment declared war 14 May 1801. An American squadron under Commodore Dale blockaded the harbor of Tripoli and under Commodore Preble (1803–4) bombarded the port five times. The city of Derme, in Barca, was also captured by General Eaton. Fearing further bombardment from the squadron and disaster by land, as well as disaffection and insurrection among his own troops, the pasha signed a treaty of peace on 3 June 1805. In 1815 Decatur forced the pasha to release all ships and prisoners of whatever nation which he had seized and also to pay indemnities on pain of having the city destroyed. Since that time several rebellions have occurred, the most notable taking place in 1842 and 1844, but all have been successfully suppressed by the Turkish government. See BARBARY; BARBARY POWERS, UNITED STATES TREATIES AND WARS WITH THE; BARCA; FEZZAN.

Trip'oli, or **Tripolyte,** a name applied to a silicious ooze composed chiefly of silicious shells of diatoms, and hence often called diatomaceous earth or wrongly infusorial earth. It resembles clay or chalk, but is a little harsh between the fingers and scratches glass. It often forms thick deposits below peat swamps. In the Miocene beds of the Atlantic coast is a more or less impure diatomaceous deposit over 200 feet in thickness. See TERTIARY.

Tripol'itan War, in American history, the name applied to a war between the United States and Tripoli in 1801–5. It was caused by the refusal of the United States to increase its payment for immunity from the depredations of the Tripolitan corsairs. After several conflicts conflicts peace was concluded 4 June 1805.

Tripos, a term applied in Cambridge University, England, to the list of successful candidates for honors in the final examinations of the different departments of the university; also the honor examination. The word is supposed to be derived from the fact that the candidate for honors formerly sat on a three-legged stool (tripod or tripos) during his disputation with the professor.

Tripp, Bartlett, American diplomatist: b. Harmony, Maine, 15 July 1842. He was graduated at Waterville College (now Colby University) in 1861, and completed a law course at Albany in 1866. He practised first at Augusta, Maine, but in the spring of 1869 removed to Yankton, Dak. In 1877 he served on the commission appointed to revise and codify the laws of Dakota, and was president of the first convention that drafted a constitution for the new State of South Dakota. During 1885–9 he was chief justice of the Territory, and in 1893 was appointed United States minister to Austria. Returning from his diplomatic post in 1897, he was, two years later, appointed chairman of the commission having in charge the settlement of complications arising between England, Germany, and America over the affairs of Samoa.

Triptolemus, trĭp tŏl ĕ mŭs, in the Greek myth, the son of Celeus, king of Attica, and of Metancira. The goddess Ceres loved him and wished to make him immortal, but was prevented through the meddling curiosity of his mother. She, however, taught him plowing and agriculture, and instructed him how to sow corn and make bread. She also gave him her chariot, drawn by two dragons, in which he

traveled over the earth, and distributed corn to all the inhabitants of the world. He is the hero of the Eleusinian mysteries and founder of the Thesmophorian celebration. In the Attic-Eleusinian fable he is represented as the judge of the dead.

Triptych, trĭp'tĭk, in art, a picture, carving or other representation in three compartments side by side; most frequently such as is used for an altar-piece. The central picture is usually complete in itself. The designs on either side are smaller.

Triqueti, Henri, ŏñ-rē trē-kĕ-tē, French artist: b. Conflans, Department of Loviet, 1802; d. Paris 11 May 1874. He seems early to have wavered between devotion to the chisel and the brush; but eventually decided on adopting the former as his implement of art. The pictures which he exhibited at the Salon in 1831 were quite eclipsed in interest and importance by his marble group 'Death of Charles the Bold,' by whose success he was induced to devote himself henceforth exclusively to sculpture. Among his statuary the most noteworthy are 'Jesus feeding the Birds'; 'The Holy Family'; 'Bacchus'; 'Dante'; etc.

Tri'reme, in classical antiquity, a galley or vessel with three benches or banks of oars on a side, a common class of war-ship among the Greeks, Romans, Carthaginians, etc. The trireme was also provided with a large square sail, which could be raised during a fair wind to relieve the rowers, but was never employed in action.

Trisac"ramenta'rian, a name given to those Lutherans and other Protestants who maintained that the sacraments of Baptism, the Lord's Supper, and Penance were necessary to salvation. This opinion was held by some Lutherans at Leipsic, and was advocated in England in the "Institution of a Christian Man," published in 1536.

Trissino, Giovanni Giorgio, jō-vän'nē jōr'-jō trēs-sē'nō, Italian author: b. Vicenza 18 June 1478; d. Rome 8 Dec. 1550. He studied the Greek language under Chalcondylas, and became also a graceful Latin and Italian writer. At a mature age he was employed by Popes Leo X. and Clement VII. upon several diplomatic missions. He wrote 'Sofonisba,' the first Italian regular tragedy; 'L'Italia liberata dai Goti,' an epic in blank verse; and 'La poetica,' a treatise on poetical art. To his suggestion is attributed the present method of writing the v and j of the Roman alphabet different from the u and i with which they were before confounded. He also endeavored to introduce distinct signs for the different sounds of o and e.

Trist, Nicholas Philip, American lawyer and diplomatist: b. Charlottesville, Va., 1800; d. 1874. He studied at West Point, but left the Military Academy without graduating; studied law with Thomas Jefferson; in 1824 took a clerkship in the United States Treasury Department; and in 1829 became private secretary to President Jackson. He was consul at Havana in 1834–6, and in 1845 was made chief clerk in the Department of State. On 15 April 1847 President Polk appointed him special agent to negotiate a peace with Mexico, American successes having practically determined the result of the war with that country. (See MEXICAN WAR.) A quarrel with General Scott hindered the performance of his mission, and his efforts were unavailing until the new government succeeded that of Santa Anna. Meanwhile Trist's commission had been canceled; but having become reconciled with Scott, he followed his counsel and continued the negotiations, which resulted in the Treaty of Guadalupe-Hidalgo (q.v.).

Tris'tan, Tristram, or Tristrem, the central figure of a circle of Celtic myths, which with modifications subsequently appeared in all European literatures. According to the story, Tristan, son of Rouland Rise, Lord of Ermonie, and Blanche Fleur, sister of Mark, king of Cornwall, was sent by his uncle to woo vicariously and bring home as bride to the British king the fair Isolt, Yseult, or Ysonde, princess of Ireland. Tristan does so, but they unfortunately partake of a love charm which is not intended for them. They fall passionately but hopelessly in love with each other. The intrigue was carried on for years, and the story narrates the adventures — grave and gay — which resulted from the somewhat difficult position of the actors. They died simultaneously, and the king generously allowed them to be buried side by side. But "even in our ashes live their wonted fires," a vine and a rose-bush grew from the graves, and, meeting, twined their branches together. The most important romance extant on the subject is that composed about 1170 by the Norman-English chevalier, Luce de Gast. The legend got abroad to France, and from thence mixed with the Arthurian myths to Germany, where Gottfried of Strasburg re-narrated part of the story in a lively poem (1210), which had great popularity in the Middle Ages. Hans Sachs is one among a host of old writers who have treated the subject. The Auchinleck MS. of Sir Tristan was published by Water Scott in 1806. See ARTHURIAN LEGEND; MORTE D'ARTHUR.

Tristan da Cunha, trĭs-tän' dä koon'yä, or **d'Acunha,** a group of three small islands in the south Atlantic Ocean, belonging to Great Britain, and situated in lat. 37° 6′ S., and lon. 12° 2′ W., about 1,680 miles west by south of Cape Town. The principal and only inhabited member of the group is 45 square miles in area. It is an extinct volcano rising almost abruptly to a height of 8,200 feet. The climate is mild, but wet. Cattle, sheep, and vegetables are raised. The island was discovered by the Portuguese navigator Tristan da Cunha in 1506, and in 1817 was taken possession of by Great Britain. Pop. (1900) 70.

Tris'tram Shan'dy, a celebrated novel by Laurence Sterne, the full title of which is 'The Life and Opinions of Tristram Shandy, Gent.' The first volume appeared 1 Jan. 1760, when Sterne was 46. Up to this time he had lived the life of an obscure, easy-going, fox-hunting churchman, but this, his first effort, so amused the public, that he continued to compose in the same strain, completing the 9th and closing volume in January 1767.

Tri'theism, the doctrine that there are three Gods, instead of three Persons in the Godhead. It has been taught both in the early Christian period, and in recent times, although so far as known to the public it has no present advocates. The Gnostics, according to Cyril

of Jerusalem, were the first to teach it. A similar doctrine was formulated in the 6th century by Ascugnages of Constantinople, after whom one of his pupils, Philoponus, founded a tritheistic sect, which was followed by another sect called Cononites. Tritheism seems to have been dead or dormant for several centuries, until Rosellinus, in the 11th century, brought it forward in a novel form. He taught that the name of God was the abstract idea of a genus containing the three Persons, the Father, the Son and the Holy Ghost. Having been condemned by the Council of Soissons in 1092 he recanted. Tritheism was not heard of again until 1691, when Dr. Sherlock, Dean of St. Paul's, London, maintained that "there are three infinite and distinct minds and substances in the Trinity." This teaching was condemned by the heads of the houses at Oxford, as "false, impious and heretical," and the controversy which followed was suppressed by an order in council.

Trit'icum, a genus of grasses (q.v.) one species of which (*T. vulgare*) is wheat (q.v.). See GRASSES.

Tritoma, a florist's name for a genus (*Kniphofia*) of African plants of the order *Liliaceæ*, one of which (*K. aloides*) is also widely known as flame-flower, red-hot-poker-plant, torch-lily, etc., and is planted among shrubbery that needs an enlivening color between midsummer and the coming of frost. The "bulbs" send up long, narrow, radical leaves from among which the rocket-like spikes of flamboyant red flowers rise four or more feet. North of Washington the plants are usually taken up and stored during the winter, and in places where the ground is likely to freeze and thaw alternately they should be mulched. They succeed well in any well drained, warm, loamy soil well protected from wind. Ordinary care in cultivation and fertilizing is sufficient. This species has a score or more of named varieties.

Triton, trī'tŏn, in Greek mythology, son of Poseidon and Amphitrite, with whom he lived in a golden palace at the bottom of the sea. The Triton Sea, a fabled ocean in Africa, appears to be his haunt in the Argonaut cycle. He is variously described, but his body is generally a compound of the human figure above with that of a dolphin below. He is also horned and prick-eared as if an ocean satyr. He carries a large shell, which serves him as a horn on which he blows loudly to rouse the waves, or softly to assuage their fury. Numerous tritons sometimes appear, creatures who in addition to the torso of a man and the tail of a dolphin prance through the billows with the forefeet of a horse. A most beautiful example of this conception is the 'Triton and Nereid' of the Vatican, in which Triton amid a group of sportive Cupids is carrying off a Nereid. Consult: Escher, 'Triton, und seine Bekämpfung durch Herakles' (1890); Brunn, 'Griechische Götterideale' (1893).

Triton. See TRUMPET-SHELL.

Triumph, a solemn procession granted to a victorious general of ancient Rome. It was bestowed only on one who had held the office of dictator, consul, or prætor, and after a decisive victory over foreign foes, or on the complete subjugation of a province. On the day of the triumph all the temples were thrown open; every shrine was decorated with garlands, and every altar smoked with incense. The general assembled his soldiers without the city, delivered to them a commendatory oration, and distributed rewards and money as their share of the spoil of the enemies. He then mounted his car and advanced to the triumphal gate (*porta triumphalis*), where he was met by the senate, and the procession was formed and marched along the Via Sacra to the Capitol. It was led by the senate, headed by the magistrates, and included a train of carriages laden with spoils — models of captured forts and cities, pictures of the country conquered, trumpeters and flute-players, white bulls or oxen destined for sacrifice, attended by priests with their insignia and implements; the most distinguished captives, etc. The triumphant general rode in a circular chariot drawn by four horses; in his right hand he bore a laurel bough, and in his left a sceptre; he was attired in a gold-embroidered robe and a flowered tunic, and his brows were encircled with laurel. In the car he was accompanied by his children of tender age, and sometimes by very intimate friends. A public slave held over his head a gold Etruscan crown ornamented with jewels. The legates, tribunes, and equestrians, with the grown-up sons of the conqueror, followed on horseback. The infantry followed in marching order, their spears adorned with laurel, shouting, *Io triumphe!* singing hymns to the gods, and praising or ridiculing their general, according to the license of the day, as their humor might dictate. As the procession ascended the Capitoline Hill some of the captives were withdrawn from it and conducted to prison to be put to death. As soon as their execution was intimated the victims were sacrificed, offerings presented to Jupiter, and the general and his friends parted in the temple, returning home in the evening accompanied by flutes and torches and a crowd of citizens. Sometimes when the spoil was great the procession extended over more than one day. The *ovation* was a lesser triumph, so called because the sacrifice on the occasion was a sheep. The general entered the city on foot, and was not attended by the senate. He was preceded by flutes, but not by trumpeters, and was not necessarily accompanied by his army.

Triumphal Arch. See ARCH, MEMORIAL.

Trium'vir, in ancient Rome, one of the three men united in office. The triumvirs were either ordinary magistrates (as the *triumviri capitales*, who were police commissioners, having charge of the jails, and acting as magistrates, the *triumviri monetales*, who were commissioners of the mint, and had the charge of coining money), or they were extraordinary commissioners appointed to jointly execute any office. The term is specifically applied to the members of the two triumvirates. See TRIUMVIRATE.

Trium'virate, an office administered by three men (*triumviri*). When Cæsar was murdered, Antony, Octavius, and Lepidus received power to restore order in the state: they were called *triumviri reipublicæ constituendæ*, and their office the triumvirate. The coalition between Cæsar, Pompey, and Crassus is also called a triumvirate, but it was merely a union or conspiracy of three private citizens without the public sanction. See ROME.

Trivandrum, trē-vän'droom, **Trivandram**, or **Tiruvanantapuram**, India, the capital of the native state of Travancore, situated on the west coast near the southern extremity of India. It has a college and a fine modern palace of the raja, and on the outskirts are a fort, a military cantonment and an observatory. It is connected by a canal with the port of Quillon. Pop. (1901) 578,882.

Triv'ium, the name given in the Middle Ages to the first three of the seven liberal arts — grammar, rhetoric, and logic. The other four, consisting of arithmetic, music, geometry, and astronomy, were called the *quadrivium*.

Tro'car, a surgical instrument consisting of a sharp-pointed rod sliding in a canula or tube, and used in the operation of tapping, or the puncturing of a cavity to drain off fluid. The rod projects a little beyond the canula, and is withdrawn after the combined instrument has been thrust in. Duchenne's trocar is an instrument for removing small portions of tissue from deep parts for the purpose of microscopic study. Durham's or the piloting trocar is a guide for the introduction of a jointed tracheotomy-tube.

Trochelmin'thes, a phylum of the animal kingdom, containing a comparatively small number of minute aquatic organisms, characterized by having that larval form denominated a trochophore (see LARVA). It is principally composed of a single class, the *Rotifera* (q.v.), plus two other groups of microscopic and little known marine "worms," the *Dinophilea* and the *Gastrotricha*. Consult Parker and Haswell, 'Zoology' (New York 1897).

Trochil'idæ, the family of the hummingbirds (q.v.).

Troch'osphere, a form of larva (q.v.), especially characterizing the *Trochelminthes* (q.v.), but also seen in some other lowly forms.

Trochu, trō-shü, **Louis Jules**, French soldier: b. Belle Isle, department of Morbihan, 12 May 1815; d. Tours 7 Oct. 1896. He was educated at the school of Saint Cyr, entered the army at an early age and in 1840 was attached to the general staff with the rank of lieutenant. Sent to Algeria in 1846, he was made adjutant to Marshal Buglaud and after some years of service in the ministry of war, acted in the same capacity with Marshals Canrobert and Saint Arnaud in the Crimea, gaining special distinction in the storming of the Malakoff bastion at Sebastopol. He fought against Austria in 1859 doing excellent service at Solferino, where he held the rank of general of division. Once more in the ministry of war and in favor with the government, he made himself *persona non grata* by the publication of his 'L'Amée françoise en 1867,' in which the deplorable conditions prevailing in the army were ruthlessly pointed out and a reorganization of the national forces on the German model was urged. After the outbreak of war with Germany he was made governor of Paris, but placed himself in opposition to the empire, and after the proclamation of the republic, 4 September, became president of the government of national defense, retaining at the same time his office of governor of the capital. In his defense of the city against the besieging German army he displayed a half-heartedness which his enemies ascribed to timidity, but which was probably due to his conviction of the hopelessness of resistance. He resigned the governorship a few days before the capitulation of the city, but remained at the head of the provisional government till the meeting of the National Assembly. In his defense he published 'L'empire et la défense de Paris devant le jury de la Seine' (1872); 'Pour le vérité et pour la justice' (1873); 'La politique et le siège de Paris' (1874).

Tro'chus. See TOP-SHELLS.

Trog'lodytes, the name given by the Greeks to tribes living in subterranean caverns. The ancients mention some tribes of Troglodytes in Asia, Æthiopia, and Egypt, but give little information concerning them. See CAVE-DWELLERS.

Trogon, a bird of the family *Trogonidæ*, of the order *Coraciiformes* or *Coccygomorphæ*, and unique in the structure of the feet, in which the first and second toes are directed backward and the third and fourth forward, whereas in all other yoke-toed birds the first and fourth toes are directed backward. The bill is short, strong and of wide gape; the tail generally long and in some species very long; the feet small and often feathered almost to the toes. They form a well-marked family of insectivorous and frugivorous forest-haunting birds of small size, whose dense, puffy plumage exhibits the most exquisite tints of pink, crimson, orange, brown, or metallic green, often relieved by delicate bands of pure white. In one Guatemalan species (*Pharomacrus mocinno*), the long-tailed trogon or quetzal, the tail-coverts of the male are enormously lengthened into waving plumes of rich metallic blue-green, as graceful and marvelous as those of the birds of paradise. This is the "national bird" of Guatemala, a distinction which it owes to its ancient association with the great Mexican deity Quetzalcoatl (q.v.).

Trogons are unable to use their feet for climbing, and usually take their station on the branches of a tree, dashing on insects as they fly past, or on some fruit at a little distance from them, and returning to their seat to eat what they have secured. The family includes about 10 genera and 50 species which abound in tropical America with a few representatives in Africa and the Oriental region. A single species, the coppery-tailed trogon (*Trogon ambiguus*), just enters the United States from Mexico. It is a magnificent metallic golden-green bird less than a foot in length which nests in holes in trees and feeds upon fruits, insects, small lizards, etc. Consult: Gould, 'Monograph of the Trogonidæ' (London 1875); Godman and Salvin, 'Biologia Americana-Centrali' (London 1896).

Troilus (trō'ĭ lŭs) **and Cres'sida**, (1) A poem by Geoffrey Chaucer, written about 1369 and adapted from Boccaccio's 'Filostrato.' (2) A play composed by Thomas Dekker and Henry Chettle, and first acted in 1599. (3) A tragedy by Shakespeare first played at the Globe about 1600. It was licensed to be printed in 1603 and 1609 and is included in the First Folio of 1423. (4) A play by Dryden printed in 1678.

Tro'jan War, The. According to Greek legend a 10 years' war carried on by the confederated Greeks led by Agamemnon, the king of Mycenæ and Argolis, against the men of Troy with their allies. The purpose of this war

was the recovery of Helen, wife of King Menelaus of Sparta, who had been carried off by Paris, one of the sons of Priam, king of the Trojans. The earliest and latest dates that have been assigned for this struggle are almost two centuries apart, the former being 1335 B.C., the latter 1149 B.C. The commonly accepted date at present is that of Eratosthenes, 1183.

Trolley. See STREET RAILWAY CONSTRUCTION.

Trolling, trō'lĭng, a method of angling that consists essentially in dragging a bait or bright object through the water, so that fishes are led to mistake it for a moving bait-fish. Trolling is ordinarily practised with a trolling-spoon, so-called because it was originally fashioned from the bowl of an ordinary teaspoon to which a hook was soldered. The modern spoon-bait is a flat piece of metal nickeled or silvered and brightly polished and variously shaped to suit the tastes of the angler so that it will spin or skip along the surface when drawn rapidly through the water. A stout hook projects from one end and the other is attached by a swivel to the line which should be protected for a foot or so by a wire or other snood to prevent it from being cut by the sharp teeth of those fishes which are generally caught by this means. Many fancy forms of spoons, consisting of several pieces of metal variously arranged, with gangs of hooks and bunches of feathers, etc., are manufactured, but these should be discarded for the simple form with a single hook. Dead minnows, hooked by the mouth or bowed so that they will revolve, pieces of white cloth, bacon rind or some other bright object, may be substituted for the spoon and for many marine fishes prove equally alluring, or baits are sometimes employed with little obvious advantage in combination with the spoon. A stout braided silk or linen line and a good multiplying reel should be employed when rod-fishing, as is generally done when pike are sought, but a cotton line will answer for sea-fishing by hand. The spoon or bait is trailed at a considerable distance behind the rowboat, sailboat or launch by which it is drawn. Trolling is effective in fishing for predaceous, surface-feeding fishes, such as pike and pickerel, blue-fish, tarpon, tuna, bonito, various species of mackerel, etc., but by employing a copper wire as a substitute for the line may be successfully used in the capture of maskinonge and lake trout when they retire to deep waters.

Trollope, trŏl'ŭp, **Anthony,** English novelist, son of F. M. Trollope (q.v.): b. London 24 April 1815; d. there 6 Dec. 1882. He was educated at Harrow School and from 1834 to 1867 was in the postal service: for the first seven years as clerk, and in 1841 as post-office surveyor in Ireland. He did excellent service in the regulation of foreign mails and rural deliveries, and he invented the postal pillar box. His novel, 'The Three Clerks' (1858), is founded upon his experiences in the civil service. His earliest novels, 'The McDermotts of Ballycloran' (1847); 'The Kellys and the O'Kellys' (1848); and 'La Vendée' (1850) attracted little attention, but in 'The Warden' (1855), the first of what are termed 'The Barsetshire Series,' was entirely successful. It portrayed cathedral society with equal minuteness and fidelity and with the utmost good humor. The scene is laid in the cathedral city of Winchester, styled Barchester in the tale, and many of the *dramatis personæ* figure in the later issues of the series, 'Barchester Towers' (1857); 'Doctor Thorne' (1858); 'Framley Parsonage' (1861); 'The Last Chronicle of Barset' (1867). That Trollope was a creative artist has been more than once denied, yet the Barsetshire novels contain at least two very real creations, the famous Mrs. Proudie, wife of the bishop of Barchester, and Rev. Jeremiah Crawley, curate of Hogglestock. Next to this series in interest and popularity are the so-called political novels, 'Can You Forgive Her?' (1864); 'Phineas Finn' (1869); 'Phineas Redux' (1873); 'The Prime Minister' (1875); 'The Duke's Children' (1880). Trollope was the author of some 70 books in all, and among the best of his novels not already cited are: 'Orley Farm' (1862); 'The Small House at Allington' (1864); 'The Claverings' (1867); 'The Eustace Diamonds' (1873); 'The American Senator' (1877); and 'He Knew He Was Right,' a masterly study of causeless jealousy (1869). Among other books may be mentioned 'The West Indies and the Spanish Main' (1859); 'Thackeray' (1879); 'Life of Cicero' (1880). During the novelist's lifetime his books were widely popular both in this country and in his own, but soon after his death his fame suffered a partial eclipse, partly due, no doubt, to his assertions in his autobiography that he was simply industrious and that anyone could do very much as he had done by simply keeping at work. In other words it was, as he put it, "merely a question of cobbler's wax and sticking to the chair." In this matter Trollope underestimated his powers. His gifts in certain directions were very great and in his novels he has given a picture of English life in the third quarter of the 19th century, which is nothing less than masterly in its faithfulness. He was a realist of the best type and he has not unjustly been styled the successor of Jane Austen so far as his careful, minute studies of English middle class life are concerned. Within a few years a revival of interest in his work has taken place and much of his former popularity has returned. His men and women are both well drawn, but perhaps in his analysis of the character of English maidens and their love affairs he is at his best. He has enriched English literature with his wholesome delightful fiction, and he deserves well of posterity. Consult Autobiography with preface by his son (1883); T. A. Trollope, 'What I Remember' (1887); Henry James, 'Partial Portraits' (1888); Yates, 'Recollections and Experiences,' chapter 13 (1884); Harrison, 'The Victorian Writers' (1895); Saintsbury, 'English Literature of the 19th Century' (1896).

Trollope, Frances Milton, English novelist: b. Stapleton, near Bristol, 1780; d. Florence, Italy, 6 Oct. 1863. In 1809 she was married to Thomas Anthony Trollope, a barrister, but the marriage proved unhappy, and in 1829 she was left a widow with six children. After the death of her husband she came to this country, where she tried to establish some kind of business in Cincinnati, but not succeeding returned three years later to England, where she turned her residence in America to account by publishing a book on the 'Domestic Manners of the

Americans' (1832). The work procured her the reputation in her country of a clever and pungent, if somewhat prejudiced, satirist, but in the United States it gave great offense, although the justice of some of her strictures is now readily recognized. Mrs. Trollope followed up this first success with a long series of works, chiefly novels, becoming one of the most voluminous novelists of her day. After 1844 she passed the greater part of the remainder of her life in Italy. The most successful of her novels was 'The Widow Barnaby' (1839), with its sequels: 'The Widow Married' (1840); and 'The Barnabys in America, or Adventures of the Widow Married' (1843). Among her other novels may be mentioned 'Tremordyn Cliff' (1839); 'Petticoat Government' (1859); 'Fashionable Life, or Paris and London,' her last work (1856). Consult 'Life' (1895) by her daughter-in-law, Frances Tiernan Trollope.

Trollope, Thomas Adolphus, English author, eldest son of F. M. Trollope (q.v.): b. 29 April 1810; d. Clifton, Gloucestershire, 11 Nov. 1892. He was educated at Winchester and Oxford. After 1841 he lived in Italy until 1888, when he made his home in Devonshire. During his Italian residence he was a correspondent of the London 'Standard' for a time, and Italian correspondent of the New York *Tribune*. His many published works include travels, novels and Italian histories. Among them are: 'A Summer in Brittany' (1840); 'A Summer in Western France' (1841); 'La Beata' (1861); 'Marietta' (1862); 'Beppo the Conscript' (1864); 'Lindisfarn Chase' (1864); 'History of the Commonwealth of Florence' (4 vols., 1865); 'Dream Numbers' (1868); 'A Siren' (1870); 'Life of Pius IX.' (1877); 'Sketches from French History' (1878); 'What I Remember' (1887–9), the last a sprightly, entertaining autobiography.

Trolls, trōlz, supernatural creatures of Norse mythology; giants in Icelandic literature; dwarfs in modern Scandinavian folklore. These latter dwell underground in a hill or mound, in this respect resembling the brownies of Scotland. Trolls are well disposed to the human race — but given to stealing provisions or even children and women. They can make themselves invisible, can foresee the future, and endow human beings with extraordinary physical strength or wealth.

Trom'bone, a musical instrument of the trumpet kind, formerly called the sackbut. It is a large deep-toned instrument with sliding tubes, and is capable within its compass of producing every sound of the chromatic scale in perfect tune. In the orchestra three trombones are used, which harmonize with each other. The range of the alto trombone is from C above the second line of the bass to G above the treble staff; that of the treble trombone is from B, the second line below the bass staff, to G, the second line of the treble; that of the bass from C, the second line below the bass staff, to G, the second line of the treble.

Tromp, trŏmp, **Cornelis,** Dutch admiral: b. Rotterdam 9 Sept. 1629; d. 29 May 1691. He was a son of Marten Harpertzoon Tromp (q.v.). Entering the service at an early age, he was barely 19 when entrusted with the command of a vessel despatched against the Algerine pirates, and two years later was made rear-admiral. After distinguished service in the Mediterranean, he fought under the supreme command of De Ruyter against the English under the Duke of York, and after the defeat of the Dutch at Lovestoft (13 June 1665), displayed great skill in effecting the retirement of the vanquished fleet. In the following year he was again under De Ruyter and fought with distinction, but owing to his impetuosity in attacking an English fleet without orders, was retired from active service. Restored to his command in 1673, he displayed consummate bravery in a series of engagements fought in June and August of that year. After the conclusion of peace with England he was placed in command of a fleet sent to the aid of the Danes against the Swedes, and won several notable victories. On the death of De Ruyter he was made commander-in-chief of the naval forces of the United Provinces.

Tromp, Marten Harpertzoon, Dutch admiral: b. Briel 1597; d. 10 Aug. 1653. He went to sea at 10, and after a period of service in the merchant marine was taken prisoner by the English and kept in confinement for several years. In 1624 he entered the navy as captain of a frigate, and in 1637 became lieutenant-admiral. On 18 Feb. 1639 he gained an overwhelming victory over a Spanish fleet in the North Sea, off Gravelines, and in October of the same year repeated his exploit by shattering a great Spanish armament in the Downs. War between England and the Dutch broke out in 1652, and he fought an indecisive battle with Blake off Dover, 29 May 1652, but lost a great part of his fleet during a severe storm in the Channel. Supplanted by De Ruyter in the command of the fleet, he was speedily restored, and on 10 December defeated Blake near Dungeness, wresting from the English the mastery of the Channel. A rather apocryphal story represents Tromp as triumphantly parading the Channel with a broom at his masthead. From 28 Feb. to 2 March 1653 he held his own in a running fight with a greatly superior English fleet, and though he sustained some loss, succeeded in bringing into safety a large convoy of merchant ships. On 13 June he was defeated by Dean and Blake in the English Channel, but took the sea again in July, and on 10 August joined battle with Monk in the Channel. The fight was turning in the favor of the Dutch when the Dutch admiral fell, shot through the heart.

Tromsö, trŏm'sė, Norway, capital of the province of Tromsö, at the northwest, stands on a small island of the same name, which consists of low fertile land and is five miles long. It is a bishop's see, and has a Roman Catholic church, town-hall, museum, etc. Its fisheries are important, and there is considerable trade in oil, herrings, dried and smoked fish. Pop. of town (1900) 6,955; of the island 74,296.

Tro'na, native hydrous sodium carbonate, or soda. It has a hardness of 2.5 to 3, specific gravity, 2.11 to 2.14; vitreous, glistening lustre; gray or yellowish-white color; alkaline taste; and is not altered by exposure to a dry atmosphere. It occurs as thin crusts in Fezzan, Africa, in an extensive bed in Churchill County, Nevada, and in fine monoclinic crystals at Borax Lake and elsewhere in California.

Trondhjem, trŏnd'yĕm (German, *Drontheim*), Norway, a seaport town on the west coast, the ancient capital of the country, beautifully situated on a bay at the mouth of the Nid, on the

south side of the Trondhjem-fiord. It has spacious, regular, and remarkably clean streets, the houses being chiefly of wood. The most remarkable edifice is the cathedral, which mainly dates from the latter part of the 12th to the end of the 13th century, and is entitled to rank, as a whole, as the most remarkable ecclesiastical structure in the kingdom; it has long been undergoing extensive restorations. Among other buildings are a residence of the royal family, an academy of science, containing a valuable library and antiquarian collections, an arsenal, etc. The manufactures are not of much importance, but there are breweries, distilleries, paper-mills, and ship-yards. A new harbor has recently been constructed, and two railways now terminate here. The trade consists chiefly in exports of timber, dried and salted fish, tar, and copper. Pop. (1901) 38,180.

Troost, Gerard, American geologist: b. Bois-le-Duc, Holland, 15 March 1776; d. Nashville, Tenn., 14 Aug. 1850. He was educated at the University of Leyden, and was, in 1809, sent by Louis Bonaparte, king of Holland, on a tour of scientific observation to Java. The capture, by a privateer, of the vessel in which he sailed having interrupted this undertaking, he came in 1810 to the United States and settled in Philadelphia where he became a member of the Academy of Natural History, of which he was elected the first president, holding office until 1817. In 1814 he established the first alum works in the United States; and in 1825 joined Robert Owen's community of New Harmony, from which he retired at the end of two years. Removing to Nashville in 1828, he was appointed professor of chemistry, mineralogy and geology in the university there, and in 1831 geologist to the State of Tennessee, both of which positions he held until his death. He published reports on the geology of Tennessee, etc. His mineral collections were the largest in the United States.

Troos'tite, a variety of the mineral willemite (q.v.), occurring at Ogdensburg, N. J., in large rough crystals usually of reddish-brown, flesh, red or gray color.

Tropæ'olum, a genus of annual and perennial herbs of the order *Geraniaceæ*. The species, of which there are about 40, are natives of South America, particularly Chile and Peru, whence many have been taken to all the warmer parts of the world to be grown in gardens for their odd, conspicuous flowers. They are mostly climbing vines, with alternate, usually simple, peltate leaves, from the axils of which the generally long-peduncled, irregular, usually yellow, orange or red, sometimes blue or purple, flowers are produced singly. Several species, especially *T. tuberosum*, produce edible tubers which are used for food in the tropics. The leaves and flowers of a few species are used as salads, for which their peculiar peppery flavor especially fits them. Their young, tender pods are often pickled and in this form are frequently employed as a substitute for capers. The species most used in this way are *T. majus* and *T. minus*, known as nasturtium, Indian cress and yellow larkspur, names which better fit plants of other families. Another species in popular use is *T. lobbianum*, which, like *T. majus*, is commonly employed as a climber upon porches, balconies, and banks. The canary-bird flower (*T. peregrinum*) is probably more often grown indoors than out, in the north. *T. minus* is a dwarf, non-climbing species which blossoms earlier and more profusely than others; it is frequently used in beds and borders. Few plants are more generally satisfactory and popular than the nasturtiums. They will thrive in any garden soil if well exposed to the sun, and not allowed to become very dry. Since they are tender to frost they are either sown rather late, or are started under glass and transplanted when the weather becomes settled. Especially fine specimens may be propagated by cuttings, and tuberous species should be dug and stored during the winter. The perennials seem to require richer soil than the annuals.

Trophonius, trō-fō'nĭ-ŭs, builder of the temple of Apollo at Delphi. After his death he was reverenced as a hero, and had an oracle in a cavern near Lebadeia in Bœotia. Pausanias describes how, after purifying himself, he was drawn through the mouth of this cave by an unseen power, and details all that he witnessed there. Don Quixote's famous visit to the oracle preserves its memory in modern literature.

Trophy, in antiquity, a monument or memorial in commemoration of some victory. It consisted of some of the arms and other spoils of the vanquished enemy, hung upon the trunk of a tree or a stone pillar by the victorious army. The custom of erecting trophies was most general among the Greeks, but it passed at length to the Romans. It was the practice also to have representations of trophies carved in stone, in bronze, or similar lasting substance. In modern times trophies have been erected in churches and other public buildings to commemorate victories, or heroic action in war.

Tropic-bird, a sea-bird of the family *Phætontidæ*, related to the pelicans. The bill in these birds is sharp, curved superiorly, and is as long as the head. The two middle feathers of the tail are very long and narrow, giving the birds the names boatswain-bird or marlin-spike among sailors. They inhabit the tropical seas, and can fly for days together without visiting land, resting and sleeping on the water. A large and well known species is *Phaeton æthereus*, which averages about 2½ feet in length, the tail-feathers being about 15 inches. It is most often seen in the Indian Ocean, where it breeds on the Mascarene Islands. The yellow-billed tropic-bird (*P. flavirostris*) is smaller and more often seen in the western Atlantic, since it annually visits Bermuda and the Antilles to breed, laying but a single, heavily blotched egg in a hollow of the beach, or sometimes in a rude nest in a tree. Consult Newton, 'Dictionary of Birds' (New York 1896).

Tropical Forests. The beauty of a tropical forest is greatly overestimated by dwellers in temperate climes. The testimony of nearly all travelers to the tropics is to the effect that nowhere did they see such an expanse of flowers, and charming forests as those they had left, and they all complain of the monotonous greenness of the trees, which have never to prepare for winter. Where the trees are most immense and crowded, as in the Amazon district, and in the East Indies, the forest is lonely and silent, shadowy and sombre in the subdued light. The trunks rise without branches for many feet, tied together with creepers and lianes, in an indescribable confusion of festoons and ropes and cables, reaching from tree to tree, and to the ground;

A TROPICAL FOREST.

some flat, some twisted either around each other or smothering a tree; some limp and swaying, others drawn taut like the stays of a ship's mast. Many of them are climbing palms (*Calamus*) and many are armed with cruel fishhook-like thorns. The lianes, and the trees themselves, support myriads of small epiphytic or parasitic plants, ferns, fungi and countless other species. Overhead the forest is roofed by the tops of the trees and of the creepers; the foliage is sharply defined against the sky, even the finely-cut delicate leaves of the great leguminous trees characteristic of these forests. Nearly all the flowers of the deep forests are confined to this upper stratum, where the sun's rays can reach them, and they are not always easily seen, being often green or white, and inconspicuous amid the verdure. The flowers of the most tropical trees, moreover, are, even when brilliant, very fugacious; one reads of people walking through the fallen scarlet petals of a day, as through the maple leaves in autumn. The forest trees, however, are very prolific, and many of them bear bud, blossom, unripe and mature fruit at the same time. The forest giants in some instances have protected themselves against the dangers of the great height and top-heaviness. Tapangs and figs have great buttresses like undulating wooden walls; others, as the screw-pines and the mangroves, perch on aerial roots, sent down from trunk and branches. The last are found along sea-shores, stepping far out into the water, backed by the screw-pines and nipa-palms and presenting an almost impenetrable front, woven into a thicket by interweaving creepers, interminably long and even thorny. It is at such edges of the forest, in clearings and along roadsides, that one sees the imagined beauty of the tropics. There the under-shrubs have a chance to grow and bloom, interspersed with graceful tree ferns and waving palms. The creepers and tree-branches descend and hang waving and blossom-laden over the masses of ferns and ground plants; and there the brilliant blossom of orchid and parasite and epiphyte are visible.

African forests are often like those of temperate zones, with open glades and clumps of trees. One can hardly call the oases of palms in the deserts, forests. In Abyssinia the country has been likened to the Scotch Highlands.

It is Australia, however, which has the most peculiar tropical forest, for in spite of the fact that her gum trees are the tallest trees in the world, it is a shadeless land. So burning are the sun's rays, that the leaves of the predominating eucalyptus are so disposed as to present always their edge to the sky; the acacias have delicate compound leaves, the ti-shrub has reduced its foliage to mere needles, and the weird she-oak has dispensed with leaves altogether, string-like branchlets taking their place. The first impression of an inland Australian forest is one of monotony in color and appearance, and of burning heat and desolation heightened by the flapping strips of the bark of the gum-trees, which is cast away as northern trees shed their leaves.

Tropics, (1) In astronomy, two circles on the celestial sphere, whose distances from the equator are each equal to the obliquity of the ecliptic, or 23½° nearly. The northern one touches the ecliptic at the sign Cancer, and is thence called the tropic of Cancer, the southern one being for a similar reason called the tropic of Capricorn. The sun's annual path in the heavens is bounded by these two circles, and they are called tropics, because when the sun, in his journey northward or southward, reaches either of them, he, as it were, turns back, and travels in an opposite direction in regard to north and south. (2) In geography the tropics are two parallels of latitude, each at the same distance from the terrestrial equator as the celestial tropics are from the celestial equator. The one north of the equator is called the tropic of Cancer, and that south of the equator the tropic of Capricorn. Over these circles the sun is vertical when farthest north or farthest south, that is, at the solstices, and they include between them that portion of the globe called the torrid zone, a zone 47° wide, having the equator for its central line.

Tro'pine, $C_8H_{15}NO$, an organic basic substance obtained by action of heat and baryta on the alkaloid atropine. Colorless crystals soluble in water and alcohol.

Tro'pisms, influences exerted by their environment upon plants or animals leading to involuntary actions, or to mechanical alterations of posture, growth, etc. Such influences are exercised by chemical agents, by the earth, water, sunlight, heat, electricity, etc. See CHEMOTROPISM; GEOTROPISM; HELIOTROPISM; STEREOTROPISM; THERMOTROPISM, etc.

Troppau, trŏp'pow, Austria, capital of Silesia, on the Oppa, 78 miles northeast of Brünn. It is well built and consists of an inner town, with pleasure-grounds on the site of the former fortifications and of three suburbs. Handsome public buildings include several fine churches, an upper gymnasium, a museum, a library of 35,000 volumes, an upper real-school, and other educational institutions. The chief manufactures are woolen and linen cloth, beet-root sugar, beer, liquors, paper. A congress of sovereigns was held here in 1820, occasioned by the revolutions of Spain, Portugal, and Naples. Pop. (1900) 26,725.

Trossachs, trŏs'ąks, Scotland, a romantic defile forming an approach to the Western Highlands, in Perthshire, about 8 miles west of Callander. It extends for about a mile between Lochs Ackray and Katrine, winding between Ben A'an on the north and Ben Venue on the south, and confined by lofty rugged precipices covered to their summits with birch, pine, and other trees. It is a favorite region for tourists.

Trotter, Newbold Hough, American artist: b. Philadelphia, Pa., 4 Jan. 1827; d. Atlantic City, N. J., 21 Feb. 1898. He was graduated at Haverford College in 1845; engaged in business till 1858, when he turned his attention to the fine arts. When the Civil War broke out he joined the Germantown Home Guards and took part in the battle of Antietam. After the war he was appointed by the United States government to paint all the mammalia of North America in a series of volumes to be issued by the government. His best known pictures include: 'Grizzly Bears'; 'Wounded Buffaloes'; 'The Last Stand'; and 'Indian Encampment'; and three paintings representing the progress of the means of travel in Pennsylvania during 50 years.

Trotting. See HORSE-RACING.

Troubadours, troo'ba-doorz, **The.** See PROVENÇAL LITERATURE.

Troubetzkoy, troo-bĕts'koi, **Amélie Rives,** PRINCESS, American novelist: b. Richmond, Va., 23 Aug. 1863. She was married to John Armstrong Chanler in 1888, but secured a divorce from him on account of incompatibility, and in 1896 was married to a Russian artist, Prince Pierre Troubetzkoy. Her first marked literary success was her novel 'The Quick or the Dead?' (1888). Her other works include: 'Virginia of Virginia' (1888); 'The Witness of the Sun' (1889); 'Barbara Dering' (1892); 'Tanis, the Sang-Digger' (1893); 'The Mocking of the Gods' (1902); 'Selené' (1905).

Troup, troop, **George McIntosh,** American statesman: b. on the Tombigbee River, then in the Territory of Georgia, 1780; d. Laurens County, Ga., 3 May 1856. He was graduated at Princeton in 1797, was admitted soon after to the bar, and at 21 was elected a member of the State legislature. He was a representative in Congress from Georgia 1807–15, and in 1816 was elected a United States Senator. From 1823 to 1827 he was governor of Georgia, and in 1829 was a second time elected to the National Senate. He was a man of great integrity, an impassioned speaker, and one of the most earnest and able of the advocates of state rights and state sovereignty.

Trout, any of the various smaller species of fresh-water fishes of the family *Salmonidæ* (q.v.); especially a "charr" of the genus *Salvelinus,* and specifically the speckled or brook trout of eastern North America (*S. fontinalis*). The name comes originally from the European brown trout (*S. faris*). The distinction between the closely related salmon-trouts (q.v.) and the true trouts, or charrs, is most surely found in the character of the dentition. Harris has explained the difference as follows:

"Put your finger in the mouth of your capture, and if you find the vomer, a bone situated on the front part of the roof of the mouth, flat, with teeth on its body, and behind these an irregular single or double series of teeth, you hold in your hand a salmon-trout. If you find the vomer much depressed, convex, and shaped like a boat, with teeth on the head of the bone, and none on its shaft, you have a charr under inspection."

All of the American charrs, except the Dolly Varden and three of the Arctic species, are natives of the waters east of the Mississippi, the common brook or speckled trout being the most widely distributed. The last species may be known at sight by the worm-like markings on the back, red spots on the sides, the large mouths, blunt snouts, and dark mottlings on their dorsal and tail fins. It is the most beautiful of all the charrs, by reason, as Harris writes, of the mantle of rose and violet which it wears, the mellow diffusion of which suggests and justifies the descriptive phrase so often applied to it by anglers — "the bloom of the trout." It is to be found in the streams flowing north into the Arctic Ocean, as far west as Victoria Land; ranging north and westward to the tributaries of the Great Lakes, and as far south as the southern spur of the Georgia Alleghanies. It also occurs near the sources of some of the rivers flowing into the Mississippi River and the Gulf of Mexico. The habits of trout are as various as the streams in which they dwell and the moods of the weather, and anglers find constant novelty in studying them in an effort to overcome their devious and cunning ways. Their breeding is after the general method of their race, but they never go down into salt water. They mate late in summer, and the male keeps off intruders. The female uses her tail in making the nest, whipping the gravel until a hole is made about two inches deep, and then cleans the bottom for a foot or more around the hole. When she is ready to spawn the male knows it and approaches her. The ova are then dropped and the milt is deposited upon the eggs, the male being within a few inches of his consort. This occurs in northern New England in November or early December; farther north at early dates. But many of the eggs fail to become fertilized, dropping down stream on the current; they are devoured by minnows or other fish who are lurking in the vicinity. Probably not 5 per cent of the ova dropped on natural spawning beds ever mature, while of those raised by the improved methods of the fish culturist fully 80 to 90 per cent come to maturity in the hatching ponds. Unfortunately those raised by the artificial process are generally placed, when fingerlings, in streams abounding with their natural enemies, and but a small percentage of these innocents become yearlings, at which age they are able to take care of themselves.

The charrs are also represented in Maine and New Hampshire by the Sunapee trout (*Salvelinus alpinus aureolus*), which is classified by ichthyologists as a local variety of the European charr or saibling (*S. alpinus*), peculiar in its local coloration, and other characteristics. It is "brownish, sides silver-gray, with small orange spots on sides above and below lateral line; caudal grayish; belly orange; anal orange, edged before with white; ventrals orange with a white band on outer rays; no mottlings anywhere." This beautiful charr is as good to eat as it is good to catch. It reaches a weight of 10 pounds, and rises freely to the fly in May and early June, after which, as the water grows warmer, it settles into deeper water, and in July and August takes a live minnow and fights finely at a depth of 50 to 60 feet. It is connected with its European type by the arctic trout, a variety (*arcturus*) of the Arctic coast north of Hudson Bay, and variety *stagnalis* of the rivers of Greenland and Boothia.

The quasky, or blueback trout (*S. oquassa*), is the smallest and one of the handsomest of the charr trouts. It never exceeds 12 inches in length, and is dark blue, the red spots small and round, and usually confined to the sides of the body. Its habitat is confined to Moosclucmaguntic Lake, of the Rangeley system, in Maine, although Professor Merriam states that identical fish have been caught in the lower Saint Lawrence River weighing 6 or 7 pounds. The blueback lies concealed in the deep water during the greater part of the year, but about 10 October comes near the shore and ascends in shoals the Kennebago River for the purpose of spawning. Half a mile above its mouth the Kennebago receives the outlet of Lake Oquassa; the trout then leaves the Kennebago to the left and runs

toward Oquassa Lake, when its voyage comes to an end. About the middle of November it goes back to Mooselucmaguntic Lake and is seen no more until October of the next year.

The blueback resembles the Sunapee trout more than any other of the charr species, yet differs from it in size, spawning habits, and markings of the young. Varieties of it are known in certain lakes in northern Quebec, and in the rivers of the Arctic coast.

The only trout native to the waters west of the Rocky Mountains is the red-spotted, bull or Dolly Varden (*S. malma*). It is found in the streams east and west of the Cascade Range from the upper Sacramento to Montana. It is a gaudy and large species, and good, but is not the equal of its Eastern congeners in game qualities.

Trout are justly regarded as the most interesting of all the smaller fishes that attract the angler. They are taken with the garden worm, the grub, the live minnow, and the artificial fly by the method explained in the article ANGLING (q.v.).

For artificial cultivation, see FISH-CULTURE.

Consult: Goode, 'American Fishes' (New York 1888); Day, 'Fish of Great Britain' (London 1880–4); Mayer, 'Sport with Rod and Gun' (New York 1892); McCarthy, 'Familiar Fish' (New York 1900); Sage and Cheny, 'Salmon, Trout' (New York 1902).

Trouvère, troo-vār', a member of the class of ancient poets of northern France, corresponding to the troubadour of Provence. Their productions partake of a narrative or epic character, and thus contrast broadly with the lyrical, amatory, and more polished effusions of their southern rivals.

Trouville, troo-vēl, France, a fashionable watering-place on the English Channel, in the department of Calvados, situated at the foot of a hill on the right bank of the Touques at its mouth, near the mouth of the Seine, 10 miles south of Havre. It has a harbor, comprising an inner and an outer basin, and a splendid beach. The Casino or Salon offers all the attractions usually found in such institutions. The season is at its height in August. Pop. (1901) 6,137.

Trowbridge, trō'brĭj, **John,** American scientist: b. Boston, Mass., 5 Aug. 1843. He was graduated from the Lawrence Scientific School, Harvard University, in 1866, and served as instructor there 1866–9. He was assistant professor of physics at the Massachusetts Institute of Technology in 1869–70, and filled the same position in Harvard 1871–81. He was professor of experimental physics at Harvard 1880–8, and in the year last named became Rumford professor of applied science there and director of the Jefferson Physical Laboratory, which post he still (1904) occupies. In 1878 he was elected a member of the National Academy of Sciences, and later was vice-president of the American Academy of Arts and Sciences. He has published: 'The New Physics' (1884); 'What is Electricity?' (1896); 'The Resolute Mr. Pansy' (1897); 'Three Boys on an Electric Boat' (1894); 'The Electrical Boy' (1891); 'Philip's Experiments, or Physical Science at Home' (1898); and many papers on physics and more especially on electricity.

Trowbridge, John Townsend, American author: b. Ogden, N. Y., 18 Sept. 1827. He received a common school education, farmed in Illinois, and then went to New York in 1846, where he wrote for journals and magazines, and in 1848 removed to Boston. In 1850 he edited for a time Ben Perley Poore's journal, 'The Sentinel,' but an editorial by him against the fugitive slave law put an end to his labors in that quarter. His story, 'Neighbor Jackwood' (1856), was an eloquent and effective protest against slavery, which was very successfully dramatized and was a most important factor in the formtion of public opinion at the North. He was managing editor of 'Our Young Folks' 1870–3, was one of the original contributors to 'The Atlantic Monthly,' in which magazine his autobiography, 'My Own Story,' appeared in 1903. He is best known at present as a writer of juvenile fiction, but he has written several novels and collections of short stories, and several books of verse. 'The Vagabonds' is his best-known poem, but as a poet he is seen at his best in such poems as 'Midsummer' and 'At Sea.' Among his juvenile fictions may be mentioned the 'Jack Hazard Series' (1871–5); 'The Tide Mill Series' (1882–7); and 'The Little Master,' which is more or less autobiographic; while among his books for older readers are: 'Father Brighthopes' (1853); 'Cudjo's Cave' (1864), which had a phenomenal sale of 13,000 copies in a week; 'Lucy Arlyn' (1866); 'The Vagabonds and Other Poems' (1869); 'Coupon Bonds and Other Stories' (1871); 'The Emigrant's Story and Other Poems' (1875); 'The Lost Earl and Other Poems' (1888). His complete poetical works were issued in 1903. For many years he has lived in Arlington, Mass.

Trowbridge, William Petit, American engineer: b. in Oakland County, Mich., 25 May 1828; d. New Haven, Conn., 12 Aug. 1892. He was graduated at West Point in 1848, served there during the last year of his cadetship as assistant professor in chemistry, later as assistant in the astronomical observatory, and in 1851 was assigned to the coast survey. His work on the Pacific coast in 1853 embraced a series of magnetic and tidal observations covering a distance of over 1,300 miles, from San Diego to Puget Sound. In 1860, at Key West, Fla., he superintended the erection of the first permanent self-registering magnetic observatory in the United States. After the outbreak of the Civil War he furnished minute descriptions of the rivers, harbors, and inlets of the Southern coast to the War Department, and later was stationed at New York, where he superintended the accumulation and transmission of field-supplies. Besides these duties he superintended the construction of fortifications at Willett's Point and at Governors Island, and the repairs of Fort Schuyler. In 1870 he became professor of mechanical engineering in the Sheffield Scientific School at Yale, and later held a professorship in the Columbia School of Mines, and at both institutions rendered an efficient service in the establishment and development of new courses of instruction. To him belongs the credit for the design of the first cantilever bridge, details of which are given in his work, 'Proposed Plan for Building a Bridge across the East River to Blackwell's

Island' (1869). A company was formed to carry out the scheme, but the financial crisis of 1873 put an end to the plan. He was the inventor of a coil-boiler, utilizing the latest knowledge in forced circulation of water. His publications include 'Heat as a Source of Power' (1874), and 'Turbine Wheels' (1879).

Troy, troi, or **Ilium**, a famous ancient city in the northwestern part of Asia Minor, the capital of the Troad, a region lying on the coast of the Ægean Sea, at the entrance to the Hellespont (Dardanelles). The fame of Troy rests upon the two Homeric epics, the Iliad and the Odyssey (see HOMER), which, incidentally to their main themes, give an account of the long war in which the city was finally destroyed. The date of the latter event is generally placed at 1184 B.C. The cause of the war was the abduction of Helen, the wife of King Menelaus of Sparta, by Paris, son of the Trojan king, Priam. Almost all the states of Greece proper united to avenge the insult, and, under the leadership of Agamemnon, king of Mycenæ, landed on the Trojan coast with a large army. After besieging the city in vain for nine years, they finally took it by a stratagem. They placed outside the walls a large wooden horse in whose interior a number of Greek heroes were concealed, and the rest of the army then retired to the ships as if they had given up the siege. The Trojans in exultation dragged the horse within the walls, and during the night the Greeks came forth and were joined by the main army which had returned from the ships. The city was now given over to fire, plunder, and massacre. Among those who escaped was Æneas, who reached Italy, and, according to the legend, was the ancestor of the first Roman kings. The Homeric legend of Troy is believed by modern scholars to be woven around a nucleus of fact. About the 6th century B.C. a new Troy, *Ilium Novum*, was founded on what has ever since been believed to be the site of the Homeric city. The place is now called Hissarlik, and lies a few miles from the southwestern entrance to the Dardanelles. Here Dr. Schliemann began excavations in 1871 and again in 1890, and his researches prove that the site has been occupied successively by seven cities. The second of these from the bottom bears marks of having been destroyed by a conflagration. Within its walls were found the ruins of a palace, and a number of gold and silver ornaments. Dr. Schliemann considered this second city to be the city of Priam and the Homeric legend, but later excavations have shown that only the sixth (the fourth from the top, later discoveries having increased the total number to nine) city can be referred to the period described in Homer. Of this city nothing remains except portions of the colossal and well-built outer walls. Consult: Schliemann, 'Trojanische Altertümer,' 'Ilios,' 'Troja'; Schuchardt, 'Schliemann's Ausgrabungen'; Schmidt, 'Schliemann's Sammlung trojanischer Altertümer.'

Troy, Ala., city, county-seat of Pike County; on the Central of Georgia and the Alabama Midland R.R.'s; about 80 miles southwest of Columbus, and 72 miles south by east of Montgomery. It is in an agricultural region in which cotton is one of the principal products. Its industries are connected chiefly with the cultivation and marketing of cotton. The educational institutions are Troy Industrial Academy for colored pupils, and public schools. There are two private banks. Pop. (1890) 3,449; (1900) 4,097.

Troy, Mo., city, county-seat of Lincoln County; on the Saint Louis & Hannibal railroad; about 50 miles northwest of Saint Louis. It is in a region rich in deposits of glass sand, iron ore, and coal, and surrounded by fertile agricultural lands. The chief manufacturing establishments are flour mills, butter and cheese factories, and tobacco factories. The shipments are chiefly farm and dairy products, tobacco products, and live stock. There is one high school, public elementary schools, and a library. There are two state banks. Pop. (1890) 971; (1900) 1,153.

Troy, N. Y., city, county-seat of Rensselaer County; on the east bank of the Hudson, 150 miles north of New York, 191 miles west of Boston, 235 miles south of Montreal, Canada, and 296 miles east of Buffalo. It is at the head of tidewater navigation on the Hudson River; and the Erie and Champlain canals have their main outlets opposite the city. Through the Erie Canal Troy has connection with the Great Lakes and the Northwest, while the Champlain Canal gives an opening to Canadian territory. The enlarged canal, called the "Thousand-Ton Barge Canal," which has received the sanction of the voters of New York State, will have a new outlet into the Hudson which will entrench the commerce of Troy more firmly than ever. Steamers and barges ply regularly between Troy and New York and the intervening cities. The United States has spent large sums of money in improving the channel in the river so the larger vessels for the new canal system will have no difficulty in reaching the canal. The steam railroads operating in Troy are the New York Central & Hudson River, the Delaware & Hudson, the Boston & Maine, and the Rutland. There are also long-distance trolley roads, some of them maintaining freight service, that extend through the Hudson Valley to Lake George on the north; through the Mohawk Valley on the west; south through the Hudson Valley, and eastward to the manufacturing villages along the Wynantskill Creek, a distance of 12 miles. These transportation facilities give Troy great advantages as a manufacturing and distributing point, so there are built up opposite the city, not half a mile from its borders, but not included in its population, the cities of Watervliet, 14,321 population, and Cohoes, 23,910 population, and the villages of Waterford, 6,157 population, and Green Island, 4,770 population. With those places Troy is connected by bridges over the Hudson River, there being four; one, the Waterford bridge, is the oldest covered wooden bridge in the United States. It was opened for wagon and foot traffic in 1804, and at the present time carries trolley cars weighing over 30 tons each. It is 800 feet long and 30 feet wide.

Trade and Manufactures.— Troy ranks sixth, in population, among the cities of the State, but fifth in industries. The chief manufactures are collars and cuffs (q.v.)— about 89 per cent of all the collars and cuffs made in the

United States are made in Troy. So great has this industry become in this city that special machinery has been invented and is manufactured here. It has an extensive system of laundries, and for this industry special machinery has also been invented and is manufactured in this city. It is noted for its high grade of merchant iron; its valves and hydrants (q.v.) (valves 96 inches inside diameter are now made here). Other manufactures are stoves, knit goods, paper, cars, electrical machinery, mechanical and engineering instruments, bells, paints, clay products, floor cloths, brushes, malt liquors, tobacco, cigars, and carriages. The famous machine-made horseshoe invented by Henry Burden is manufactured here. He also made the largest over-shot water-wheel yet (1903) made in America. It is 60 feet in diameter. The guns for coast defense of the United States are made at the government arsenal at Watervliet, opposite Troy. The machine shop is 1,000 feet long and traveling cranes operate through its entire length, carrying guns of the largest calibre, weighing 125 tons, as though they were toys. This shop contains some of the largest lathes and boring machines in the world. There is a State dam across the Hudson at Troy and six factories are operated by the power here obtained. There is considerable water power on the Wynantskill and Poestenkill creeks; each stream has a fall of about 200 feet in the hills east of the city.

In 1900 the city contained 789 manufacturing establishments with $26,489,272 capital, employing 24,504 persons, paying $9,700,726 in wages, and $12,889,944 for materials. The total output was $31,987,536.

The city is situated on a narrow alluvial plain, extending north and south along the river front for six and one half miles. From the plain, and paralleling the river, a range of hills arises, in some places to a height of 500 feet. While most of the city is confined to the level ground, the finest residential part is on the hills, of which the most prominent is Mount Ida. On a spur of this hill, jutting out boldly into the centre of the city, stands Prospect Park. The waterworks reservoirs are located on the hills east and northeast of the city. A new gravity system is being installed at a cost of $1,250,000, with a daily capacity of 18,000,000 gallons, and the old gravity systems will supplement this with 9,000,000 gallons. There is also a pumping station on the bank of the river at the north end of the city. From these pumps has been obtained the supply of water for the lower level of the city, while a small gravity plant has given insufficient supply to the more elevated portions. The new system will provide an abundance of water for all parts of the city for years to come.

There are a number of cemeteries in Troy, but Oakwood, containing 400 acres, crowns one of the hills east of the city, overlooking the valley of the Hudson opposite the delta of the Mohawk. The cemetery plateau is 300 feet above the plain, to which it inclines with precipitous sides. The Hudson is in sight for miles, while the Mohawk breaks through the hills to the west, tumbles over a rocky precipice 60 feet in height, then passes peacefully through its four mouths into the Hudson. Oakwood cemetery is a resting place for two distinguished national heroes, — Gen. John E. Wool, the commander-in-chief of the American forces in the Mexican War, and Gen. George H. Thomas, "the Rock of Chickamauga." General Wool's monument is a monolith; the largest stone ever cut in this country, 60 feet high, and weighing more than 100 tons. The Earl Crematory, a prominent object in Oakwood, is a memorial building erected at great cost, and contains, aside from a perfect incinerating apparatus, some fine mosaics, rare marbles, and rich stained glass. The streets of Troy are regularly laid out until the river front is reached, when the streets are intersected by River Street, which follows the curvatures of the Hudson River. These irregular intersections form triangles misnamed squares. In one of these stands the Soldiers' and Sailors' monument, 93 feet high,. costing over $50,000. On the lower sides of the stone work are bronze bas-reliefs representing battle scenes; one of them being a representation of the engagement between the Monitor and the Merrimac. This is a particularly appropriate scene because most of the armor plate of the Monitor was rolled in Troy. There are 100 miles of streets in Troy, of which 45 67-100 miles are paved. There are 169 2,000-candlepower arc-lights.

Buildings.— Troy has many public buildings of note and many of its citizens have built beautiful and substantial memorials for charitable and educational work. The Emma Willard Seminary (q.v.) consists of three buildings — the Gurley Memorial, the Plum Memorial, and the Sage Memorial Hall. In front of this group of buildings is a beautiful bronze statue of Emma Willard. Another educational enterprise which has done much to make Troy famous is the Rensselaer Polytechnic Institute (q.v.), an excellent school of civil engineering, and its graduates have designed some of the greatest engineering works of modern times. The post-office, a fine granite structure; the savings bank building, which cost about $600,000, and which contains a fine music hall with seating capacity of about 1,500; the public library, white marble in the Italian Renaissance style, cost about $300,000; the court house, city hall, Rowe Memorial, Young Men's Christian Association, Young Women's Association; R. P. I. Alumni, Ilium, the new union station, and the Rensselaer Hotel. The charitable and religious institutions are the Troy Orphan Asylum, a group of buildings of the Elizabethan style of architecture; three Roman Catholic orphanages, a reformatory, a hospital, and a home for the aged; Saint Paul's Church (P. E.), Saint John's (P. E.), Saint Mary's (R. C.), Saint Peter's (R. C.), State Street (M. E.), and Second Presbyterian. The public and parish school buildings recently erected are all models of completeness and of beautiful architecture.

Finances.— The assessed valuation of taxable property in 1903 was: real estate, $50,989,946; personal, $3,024,342. Property exempt by law, $8,997,069; and the net bonded debt was $1,735,168. The maintenance and operation of the city was $860,935. Of this amount there was expended on schools, $215,000; police department, $112,000; fire

department, $81,000; streets, $139,000; municipal lighting, $83,000.

There are six national banks with an aggregate capital of $1,390,000; surplus, $1,035,000, and deposits, $7,870,102; one state bank with a capital of $50,000, and two trust companies with capital, surplus, and deposits of $4,798,021. There is one savings bank with deposits of $10,065,516.

History.— The site of Troy was the seat of several farms, in 1786, when Albany had been called a city for a hundred years. The Mohegan Indians formerly had a fortified village on the site of Troy at a point just north of the Poestenkill Creek. The Mohawk tribe of Indians had a palisaded village on the west side of the Hudson River on an island formed by the third and fourth branches of the Mohawk River at its mouth. Hostilities broke out between tribes, in which the Mohawks were successful, and the Mohegans were finally driven to the Connecticut River. The Dutch families, who afterward took possession of this ground on the east side of the river, found a natural meadow land, and they called it "Pafraets' Dael," "The paradise of a lazy man."

The islands forming the delta of the Mohawk River, opposite Troy, were the scene of much activity during the Revolutionary War. The American army encamped here to obstruct the march of Burgoyne. The island which was formerly the site of the Mohawk Indian village, above referred to, was fortified on its north side by earthworks, under the superintendence of Thaddeus Kosciusco. Gen. Philip Schuyler commanded the American troops, with his headquarters at Van Schaick's house, which is still standing. The fortifications may yet be plainly seen. From these islands the American army marched north under Gen. Gates, who succeeded Schuyler, and soon afterward fought the British at Schuylerville in what is known as the battle of Saratoga.

Three miles above the site of Troy stood a village called New City, afterward Lansingburg. In 1787 New City had nearly 500 inhabitants, Albany had about 3,000, and Troy consisted of a few farm houses. The deeper channel in the river at Troy made navigation so much easier than at New City that the enterprising settlers who began to arrive from New England, seeing its advantages, located here. The settlement grew rapidly, being known at this time as "Van der Heyden's." In 1789 the settlers changed the name to Troy. The falls on the Poestenkill Creek were taken advantage of, and three mills were here erected, a saw mill, a grist mill, and a paper mill, the last the first of its kind in northern New York, was built in 1792. In 1808 a rolling mill was established on the Wynantskill Creek. Troy soon outstripped Lansingburg, and in 1793 the State legislature decided on Troy as the county-seat of Rensselaer County.

During the War of 1812 the merchants of Troy supplied large quantities of provisions to the American army. Samuel Willson, who slaughtered cattle and packed beef in Troy, supplied his beef to the army "packed in full bound barrels of white oak." It soon became known as "Uncle Sam's," as Samuel Willson was familiarly called, and from this grew the well-known appellation, "Uncle Sam," as applied to the United States.

The charter incorporating Troy as a city was passed by the legislature in 1816.

The State dam was constructed across the Hudson River at Troy in 1823. This marks the tidal point of the Hudson River. At this time commerce with New York was mainly by sloops, of which 39 were recorded as owned by Troy merchants. In addition to its rapidly growing commerce, Troy now began to acquire fame as an educational city; the Emma Willard Seminary was established about this time, and in 1825 the Rensselaer Polytechnic Institute was opened. The population of Troy was now 7,859. The population and industries increased rapidly, and it became an important manufacturing centre. Its collar and cuff and iron industries gave its growth a great impetus. Its remoteness from the mines has caused it to lose its supremacy in the iron industries, but the collar and cuff industry has steadily increased. Troy has had several destructive fires. The most notable was the one of 10 May 1862, when the total value of property destroyed was $2,677,892; about 800 buildings were burned.

The village of Lansingburg and the city of Troy gradually grew toward each other until the dividing line was not apparent to the eye, yet each maintained its separate government. In 1900 an act was passed by the legislature annexing Lansingburg and other outlying territory to the city of Troy. This act did not take effect until 1 Jan. 1901, too late to receive notice in the United States census of 1900. However, an enumeration was taken by the census officials, as shown in the census reports, giving the population of Greater Troy as 75,057. All figures given in this article relating to the various expenditures and the output of its industries relate to Greater Troy and its population of 75,057. Consult: Weise, 'Troy's One Hundred Years.'

ARTHUR MERRIAM WIGHT,
Secretary of Chamber of Commerce.

Troy, Ohio, village, county-seat of Miami County; on the Miami River, the Miami & Erie Canal, and on the Cleveland, C., C. & St. L. and the Cincinnati, H. & D. R.R.'s; about 78 miles north by east of Cincinnati. It is in an agricultural and stock-raising region, and has considerable manufacturing interests. The principal manufactories are planing mills, foundries, bent wood and wagon factories, and a flour and grist mill. There is considerable trade in farm and dairy products, and in the local manufactures. The educational institutions are a high school, Saint Patrick's Academy, public and parish schools, and a public library. The two banks have a combined capital of $300,000. Pop. (1890) 4,494; (1900) 5,881.

Troy Weight. See WEIGHTS AND MEASURES.

Troyes, trwä, France, capital of the department of Aube, and formerly of the province of Champagne, 103 miles east-southeast of Paris by rail, on the left bank of the Seine. Many of the streets are narrow and irregular, and lined with mediæval timber houses. The principal edifices are the cathedral, a splendid specimen of florid Gothic; the churches of Saint Urbain, of

Saint John, and of Saint Madeleine, in the flamboyant style; the *hôtel-de-ville*, the prefecture, the hospital, museum, *palais de justice*, and public library, containing 100,000 printed volumes and nearly 5,000 manuscripts. The manufactures consist of cottons, woolens, hosiery, soap, artificial flowers, paper, gloves, etc. There are numerous worsted and cotton mills. It carries on an important trade in grain, wine, brandy, colonial produce, famous sausages, hemp, wax, wool, wood, iron, lead, zinc, etc. The town was in existence previous to the conquest of Gaul by the Romans, by whom it was called Augustobona. The Treaty of Troyes between Charles VI. and Henry V. of England was concluded in 1420. Nine years later the English were expelled by Joan of Arc. Pop. (1901) 53,159.

Troyon, trwä-yôn, **Constant,** French painter: b. Sevres 25 Aug. 1810; d. Paris 21 Feb. 1865. He was one of the first and greatest of the French "Naturalists," and was trained as a painter on porcelain. His pictures rank high among those of his contemporaries, and his cattle and landscapes rival the best productions of the Dutch school. There are several good examples of his work in the New York Metropolitan Museum, and among them 'Cow,' and 'Landscape and Cattle.' Consult: Dumesnil, 'Constant Troyon' (1888); and Hustin, 'Les Naturalistes Français' (1893).

Trozo, trō'thō, or **San José,** sän hō-sā', Philippines, a suburb of the city of Manila occupying the centre of the northeast quarter of the city, southeast of Tondo. The people are largely engaged in the mechanical industries; there are also a few Chinese and native residents of the upper class.

Tru'ant School, the popular name for a school or reformatory for truant or vagabond children; organized under State auspices and managed by the State educational officials. In 1850, Massachusetts passed a law permitting the punishment of truancy by confinement. New Hampshire, New York, Rhode Island, and Connecticut made similar legislation before 1865; and New York and other cities made like provisions; but where the law was not a dead letter, habitual truants were classed as "juvenile disorderly persons" and were sent to almshouses or reformatories. In 1880, Massachusetts began to establish county schools for truants. In 1900 there were in the United States six county schools and seven city schools of this nature, five in New York, one in Boston, and one in Chicago. Many States and cities provide for the arrest of truants and their being replaced in the public schools, a method followed in continental Europe, where there are no institutions exactly parallel to the American truant school. In Great Britain there are two provisions for school offenders, the day industrial and the truant schools, based on the Industrial Schools Act of 1866, for "any child found habitually wandering, or not under proper control, or in the company of rogues, vagabonds, disorderly persons, or reputed criminals"; or any child whose parents neglect to provide for its instruction.

Truce, a temporary suspension of hostilities between two armies or states for negotiation or other purposes. A truce to become binding requires the sanction of the commander-in-chief, but may be ended before the period previously agreed upon on due notice being given to the opposite party.

Truce of God, the title given in the Middle Ages to a limitation of the right of private warfare introduced by the Church in order to mitigate an evil which it was unable to eradicate. This truce of God provided that private feuds should cease, at least on the holy days, from Thursday evening to Sunday evening in each week; also during the whole season of Advent and Lent, and on the octaves of the great festivals. This salutary regulation was first introduced in 1033 in Aquitaine, then in France and Burgundy. Under William the Conqueror it was introduced into England, and in 1071 into the Netherlands. At many councils it was a chief subject of discussion, and was enjoined by special decrees. Whoever engaged in private warfare on the prohibited days was excommunicated. The truce of God was also extended to certain places, as churches, convents, hospitals, churchyards, etc., and certain persons, as clergymen, peasants, merchants, pilgrims, and in general, all defenseless persons. At the Council of Clermont (1095) it was made to include all Crusaders. This institution died out when the rulers of the various countries became strong enough to curb effectually their turbulent and powerful subjects.

Truck Farming. See HORTICULTURE.

Truck System, the practice of paying the wages of workmen in goods instead of money. This practice has prevailed in various places and trades, particularly in the mining and manufacturing districts of Great Britain, and the workmen have often had to pay exorbitant prices for their goods. Several acts of parliament have been passed with the object of abolishing the system. In the United States the system is practically followed in some parts of the Pennsylvania coal fields where miners are paid in store checks; at the end of the week or month their wages have been consumed by rent, supplies, groceries, and other necessaries of life.

Truckee, trŭk-ē', a river, the outlet of Lake Tahoe in California. It flows north, then enters Nevada and flows east, then north, entering Pyramid Lake, which has no apparent outlet. The river is about 125 miles long. Reno, Nev., is the most important town on the river.

True, Alfred Charles, American statistician: b. Middletown, Conn., 5 June 1853. He was graduated at Wesleyan University, Conn.; and after a post-graduate course at Harvard, 1882–4, was an instructor at Wesleyan 1884–8. He then entered the United States Department of Agriculture; was editor in the office of the experiment station in 1889–90, was vice-director of the same in 1891–2, becoming director of the experiment station in 1893. He is editor-in-chief of the 'Experiment Station Record' and the 'Experiment Station Work,' and has supervision of expenditures for agricultural experiment stations in all the States and Territories, as well as of investigations in irrigation, and agriculture in Alaska, Porto Rico, and Hawaii.

True, Frederick William, American biologist: b. Middletown, Conn., 8 July 1858. He was graduated at the University of the City of New York in 1878; entered the government service in 1878; and was expert special agent on

fisheries for the 10th census, 1879. He was curator of the department of mammalia at the United States Museum 1881–92, and executive curator 1892–7. In the year last named he was appointed head curator of the department of biology at the United States National Museum. He has written 'Review of the Family of Delphinidæ'; etc.

True'blood, Benjamin Franklin, American publicist: b. Salem, Ind., 25 Nov. 1847. He was graduated from Earlham College, Richmond, Ind., in 1869, and entered the ministry of the Society of Friends the same year. He was president of Wilmington (Ohio) College 1874–9, and of Penn College, Oskaloosa, Iowa, 1879–90. In 1890 he became foreign secretary of the Philadelphia Arbitration and Peace Society, and since 1892 has been secretary of the American Peace Society, in Boston. He has published 'The Federation of the World' (899); and a translation of Kant's 'Zum ewigen Frieden' (1897).

Truf'fles, subterranean saprophytic fungi (q.v.), chiefly European *Tuberaceæ,* the mycelia of which grow in leaf-mold. Their fructifications are edible, solid tuber-like bodies, ranging from the size of a filbert to that of a potato, and ultimately set free by the decay of the mycelium. There are several species of truffles, which are not only nutritious but very much esteemed for their aromatic flavor and piquant taste, and are used in fine cooking, pâtés, etc. Although white truffles are somewhat in demand, it is the black or queen truffles (*Tuber cibarium, T. æstivum,* or *T. melanospermum*), of England and France, which are in most demand, those of Perigord being considered as the finest. These are of varying size, and have a gray or seal-brown or nearly black skin, which is pebbled, or warty, with small angular protuberances. The firm interior, with such a texture as has an immature puff-ball, is also dark-brown, somewhat mottled by reason of its chambered structure, and reticulated with the white films of hyphæ. Truffles are practically never cultivated, in spite of various attempts, but are occasionally cared for *in situ.* They thrive best in limestone soils, and in such light, moist, but well-drained woodlands, as are frequented by the various species of trees near which the truffles prefer to exist — possibly on their decaying roots. The tubers are entirely subterranean, occurring either deep in the ground or close to the surface, ripen in winter, and are dug out, either laboriously by unaided man with a sharp spud, or by the aid of dogs and pigs. The latter are commonly used in Perigord, their rooting instincts, and fine nose for scent being turned to account. A trained sow will sniff the peculiar, pervasive odor exhaled by a ripe tuber, and will make directly for it, either laying it bare or uprooting the solitary tuber, to be rewarded with an acorn or chestnut. Good intelligent sows in a prolific forest will unearth 10 or 12 pounds of truffles in a day, which will bring in a good price. Dogs are also used in the same manner, especially by poachers. The red truffle (*Melanogaster variegatus*) is, like the false truffle (*Scleroderma vulgare*), allied to the puff-balls; and *Terfezia leonis* is the white, potato-like truffle of Italy. The African species of *Terfezia* and *Tirmannia,* somewhat inferior in quality, in some parts of Algeria and Tunis form an important food-supply for the people.

Trujillo, troo-hēl'yō, or **Truxillo,** Peru, the capital of the department of Libertad, situated close to the Pacific coast, 300 miles northwest of Lima. It is surrounded by walls, and has a cathedral, a national college, and a university. The port is Salavery, connected with the city by a short railroad. Pop. 11,000.

Trumbull, trŭm'bŭl, Annie Eliot, American novelist, daughter of J. H. Trumbull (q.v.): b. Hartford, Conn., 2 March 1857. She was graduated from the Harvard High School in 1876 and has published: 'A Cape Cod Week' (1898); 'Rod's Salvation' (1898); 'Mistress Content Cradock' (1899); 'Life's Common Way' (1903); and other works.

Trumbull, Gurdon, brother of H. C. Trumbull (q.v.), American artist: b. Stonington, Conn., 5 May 1841; d. Hartford, Conn., 28 Dec. 1903. He learned his art in Hartford and New York. It was in studies of fish that he achieved his reputation, and his most noted works were 'Over the Fall'; 'A Plunge for Life'; and 'A Critical Moment.' He was the illustrator of the work of his sister, Mrs. Annie T. Slosson, 'The China Hunters' Club,' and was author of the work entitled 'Names and Portraits of Birds.'

Trumbull, Henry Clay, American author and editor: b. Stonington, Conn., 8 June 1830; d. Philadelphia, Pa., 8 Dec. 1903. He was educated at Williston Seminary, East Hampton, Mass., and at first engaged in railroad business at Hartford, but in 1858 became State missionary of the American Sunday School Union for Connecticut. He was ordained to the Congregationalist ministry in 1862, entered the Union army as chaplain, and served through the war with the exception of a portion of 1863, when he was held a prisoner by the Confederates. He was appointed missionary secretary for New England of the American Sunday School Union in 1865, normal secretary in 1871, and in 1875 he removed to Philadelphia. He purchased the chief interest in the Philadelphia 'Sunday-School Times' in that year and was its editor until his death. He discovered the site of Kadesh-barnea on the southern border of Palestine while on a tour of the East in 1881. His works include: 'The Sabbath School Concert' (1861); 'The Knightly Soldier' (1865); 'Kadesh-barnea' (1884); 'Studies in Oriental Social Life' (1894); 'War Memories of an Army Chaplain' (1898); 'Old Time Studen' Volunteers' (1902); etc.

Trumbull, James Hammond, American philologist, brother of H. C. Trumbull (q.v.): b. Stonington, Conn., 20 Dec. 1821; d. Hartford, Conn., 5 Aug. 1897. He was educated at Yale, assisted Rev. James H. Linsley in compiling catalogues of the mammalia, reptiles, fishes, and shells of Connecticut in 1842–3, was assistant secretary of the State of Connecticut in 1847–52 and again in 1858–61, and secretary during the Civil War, 1861–5. He was corresponding secretary of the Connecticut Historical Society in 1849–63, and its president in 1863–89. In 1863–91 he was librarian of the Watkinson Library of Reference at Hartford, was an original member of the American Philological Society from its organization in 1869, and was its president in 1874–5. He was elected to the National Academy of Sciences in 1872 and was appointed lecturer on the Indian languages of North

America at Yale in 1873. He prepared the catalogue of Americana belonging to George Brinley which added much to his reputation as a bibliographer, and devoted the closing years of his life to the compilation of a dictionary and vocabulary from John Eliot's Indian Bible, which he was reputed to be the only living American able to read. His manuscript was published under the title 'Natick Dictionary' (1903). His other works include: 'Colonial Records of Connecticut' (3 vols., 1850–9); 'The Best Method of Studying the Indian Languages' (1871); 'Historical Notes on the Constitution of Connecticut' (1872); 'Indian Names of Places in and on the Borders of Connecticut with Interpretations' (1881); 'Memorial History of Hartford County' (2 vols., 1886); etc.

Trumbull, John, American jurist and poet: b. Westbury (now Waterbury), Conn., 24 April 1750; d. Detroit, Mich., 10 May 1831. Graduated at Yale in 1767, he began in 1770 to contribute to the *Connecticut Journal* and *New Haven Post-Boy* a series of essays called 'The Correspondent,' patterned after 'The Spectator,' in which he satirized the controversial writers of the time and the American slave-traffic; and published in that year 'An Essay on the Use and Advantages of the Fine Arts.' In 1771 he became a tutor in Yale, and began the study of law, which he continued in John Adams' Boston office in 1773, in which year he was admitted to the bar. He practised at New Haven in 1774–6, at Westbury in 1776–81, and from that time at Hartford. In 1789–95 he was State's attorney for Hartford County, in 1792 and 1800 was elected to the legislature, in 1801–7 was judge of the Connecticut Superior Court, and in 1808–19 of the Court of Errors. From 1825 he resided at Detroit. His 'Progress of Dulness' (part i. 1772; part ii. 1773) was his first elaborate work in verse. It was a clever satire on the defective culture of contemporary American society, and its epigrammatic ridicule made a great stir. But he is known for 'McFingal' (1782), a burlesque epic, in the metre and much in the style of 'Hudibras,' which it follows, however, without sacrifice of originality. It admirably developed the humorous characteristics of that disturbed time, and from the first had an unprecedented popularity. Its hero is Squire McFingal, a Scottish-American Tory politician of Massachusetts, with a gift for tedious and inflated speechifying, his Whig opponent, Honorius, seems to be, according to Tyler, a portrait of John Adams. It was the most representative of the distinctly literary productions of the Revolution, to whose movement it greatly contributed. No contemporaneous record presents so well the thought of the period. In pointedness, in ingenuity of rhyme, in the skilful arrangement of its ludicrous narrative, it is admirable. Many extracts such as:

> No man e'er felt the halter draw,
> With good opinion of the law,

passed into the general anthology of quotations. It was reprinted by Lossing, with introduction and notes, in 1857, and another edition of it appeared in 1881. In all, about 40 editions have been circulated in the United States and England. For its full understanding the work now requires some study of the Revolutionary epoch. Trumbull's 'Poetical Works' were collected in 1820. Consult the excellent account in Tyler, 'Literary History of the American Revolution' (1897).

Trumbull, John, American artist: b. Lebanon, Conn., 6 June 1756; d. New York 10 Nov. 1843. He was graduated at Harvard in 1773; studied painting in Boston; served in the Revolutionary War; and in 1780 went to England to study under West, but was imprisoned on a charge of treason and forced to leave the country. Subsequently he returned to England and became the pupil of West. In 1786 he produced his first historical picture, the 'Battle of Bunker Hill'; which was soon followed by the 'Death of Montgomery Before Quebec' and 'Sortie of the Garrison from Gibraltar.' In 1817 he was employed by Congress to paint four pictures for the rotunda of the Capitol at Washington, namely 'The Declaration of Independence,' the 'Surrender of Burgoyne,' the 'Surrender of Cornwallis,' and the 'Resignation of Washington at Annapolis.' He was for many years engaged in finishing his sketches, many of which, together with portraits and copies of old masters, 54 pictures in all, he surrendered to Yale College in consideration of an annuity of $1,000. Consult his 'Autobiography' (1841).

Trumbull, Jonathan, American patriot: b. Lebanon, Conn., 12 Oct. 1710; d. there 17 Aug. 1785. Graduated from Harvard in 1727, he studied theology and was licensed, but in 1731 left the ministry for the law, was a member of the Assembly in 1733, its speaker in 1739, and deputy-governor in 1767–8. From 1769 until his resignation in 1783 he was governor. During the Revolution he worked with vigor for independence. He is said to have been the original "Brother Jonathan" (q.v.), that being Washington's familiar name for him. He was the only colonial governor to take the popular side in the struggle; and when notified by Washington (August 1776) of the inadequacy of the army, called for nine more regiments of 350 each, in addition to the five Connecticut regiments already supplied. These troops arrived at New York just in time to meet the British advance. In 1766–9 Trumbull was also chief justice of the superior court of Connecticut, and as such he has been highly praised by Bancroft. Consult the 'Life' by Stuart (1857).

Trumbull, Jonathan, American politician, son of the preceding: b. Lebanon, Conn., 26 March 1740; d. there 7 Aug. 1809. He was graduated from Harvard in 1759, and prior to the Revolution was a member of the Connecticut legislature and speaker of the House. He was paymaster-general in the Continental army, 1775–80, and military secretary to Washington, 1780–3. He sat in Congress 1789–95, being speaker of the House of Representatives 1791–5, was United States senator 1795–6, lieutenant-governor of Connecticut 1796–8, and governor from 1798 till his death.

Trumbull, Lyman, American politician: b. Colchester, Conn., 12 Oct. 1813; d. Chicago, Ill., 25 June 1896. He studied law in Georgia, was admitted to the bar and settled in Belleville, Ill., in 1837. He was secretary of state of Illinois in 1841–2; and justice of the Supreme Court of the State in 1848–53. He was United States senator 1855–73, and although formerly

a Democrat, became prominent as a Republican. He secured the passage of the 14th Amendment; and was one of the Republicans who voted against the impeachment of Andrew Johnson. After 1872 he supported the Democratic party.

Trumpet, a musical wind-instrument, generally made of brass, and sometimes of silver. The orchestral or slide trumpet consists of a tube about 5½ feet long, twice curved, and ending in a bell. The slide is on the second curve. The scale of the slide trumpet begins with A sharp in the first space of the bass stave, and extends to C above the treble stave, but C below the bass stave can be produced. The natural notes are C (below bass), C (octave), G, middle C, E, G, B flat, C, D, E, F, G, A, B flat, B, C. A univalve trumpet was introduced by Bassett in 1876. The addition of the valve greatly improves the slide trumpet in respect of accuracy and completeness without injuring its characteristic tone in any way. The trumpet, from its exciting effect, is well-fitted for military music.

Trumpet-fish, or **Trumpeter,** one of the most important food-fishes (*Latris hecatcia*) of the southern hemisphere. It ranges from 30 to 60 pounds in weight, and is considered the best flavored of any of the fishes of New Zealand, Tasmania, and South Australia. Large numbers are smoked and sent into the interior.

The name is also applied to several species of fishes belonging to the small families *Aulostomidæ, Fistulariidæ* and *Macrorhamphosidæ,* all belonging to the order *Hemibranchii,* and all having the facial bones much elongated to form a tube bearing the small nearly or quite toothless mouth at the end. They are fishes of peculiar aspect, the body as well as the head being elongated and sometimes protected by bony plates, and in the *Fistulariidæ* the caudal fin bears a pair of long, slender filaments. These fishes are variously known also as tobacco-pipe fishes, cornet-fishes, snipe-fishes and bellows-fishes, all these names having reference to the tubular snout. They are tropical, and species of each family occur in the Gulf of Mexico and the southern waters of the United States.

Trumpet-flowers, plants belonging to the allied genera *Tecoma* and *Bignonia,* having trusses of gaily-colored flowers with funnel-form corollas. *T. grandiflora* is the showy trumpet-flower or trumpet-creeper from China, with drooping, salmon-yellow and scarlet flowers three inches broad, but is not so hardy as American *T. radicans,* which is a very common shrub of the South, and is called Virginia trumpet-flower by foreigners. It climbs high by rootlets, sending out long, pendulous sprays with opposite pinnate leaves, and ends in a corymb of tubular flowers, orange colored as to the tubes, and expanding into a five-lobed scarlet limb. Both of these species are planted extensively, as ornamental vines, to cover walls, verandahs, etc. The yellow elder, or upright trumpet-flower (*T. stans*), is an evergreen shrub of erect growth introduced from Central America, and growing readily in southern Florida. The leaves are pinnate, and immense panicles of golden-yellow flowers bend down the branches with the weight of their bloom. The Cape honeysuckle (*T. capensis*) is an evergreen climber which can be trained into shrub form, and is useful for Florida; it can also be grown as a climber, or like *T. smithii,* as a pot-plant, in northern greenhouses. *Bignonia venusta* of Brazil is another greenhouse climber in the North, but can be grown out of doors in warm climates. Its hanging, string-like shoots are clothed with axillary and terminal clusters of large tubular orange-yellow flowers, for four or five feet of their length. The cross-vine, or quarter-vine (*B. crucigera*) of the southern United States, so called because a transverse section of the stem shows a cruciform marking, is also known as the tendriled trumpet-flower. The leaves are pinnate with only two leaflets, and terminate in a branched tendril; the flowers are large and campanulate with undulate or slightly lobed limb borne in few-flowered cymes. *Gelsemium sempervirens,* formerly classified among bignonias, is not only called yellow jasmine, but also the evergreen trumpet-flower. Various species of *Solandra, Brunfelsia, Catalpa,* and *Datura,* are known as trumpet-flowers; especially tropical tree-species of *Datura,* such as in Java form boundary hedges about the coffee plantations, and are a marked feature in the landscape. *Thevetia neriifolia,* of tropical America, is an oleander-like, poisonous plant, with yellow, fragrant flowers, and curious fruit, and is known as yellow-oleander, or trumpet-flower; it grows luxuriantly in Florida.

Trumpet Shell, a large marine gasteropod (*Triton variegatus*) of the South Seas. The shell, which is a foot or more in length, is white mottled in irregular spiral rows with ruddy brown and yellow, deepening into chestnut at the point; interior white; lip with smooth white ridge on a black ground. It is employed by the Australian natives and the South Sea Islanders as a trumpet. To fit the shell for this purpose a round hole is bored at the side, about one fourth the length from the tip, and a loud hoarse sound is produced by blowing across the hole, as a performer plays a flute. While blowing, the right hand is placed in the cavity of the shell. The large conch shells of the West Indies are frequently pierced and used for the same purpose.

Trumpeter, a genus (*Psophia*) of wading-birds, related to the cranes, found in South America, and so named from their hollow cry, which results from the peculiar conformation of the windpipe or trachea. The bill is short and stout, and except for their long legs and necks these birds resemble fowls. The most familiar species is the golden-breasted trumpeter (*P. crepitans*), which is readily tamed, and becomes a favorite inmate of the house. The head and neck are velvety-black; the breast is glossy-green; the back gray; and the wings, tail, and under parts black. This species, like the others, lives in the forests in flocks; and feeds upon fruit, seeds, and insects. They run swiftly but seldom fly. The eggs, numbering 10 or 12, are light-green in color, and are deposited in a mere hole scratched in the ground. Only about five other species are known, all belonging to the single genus and constituting the family *Psophidæ.*

Trumpets, Feast of, a Jewish feast on the first day of the 7th month (Tisri), which was to be kept as "a sabbath, a memorial of blowing of trumpets, an holy convocation." No servile work was to be done in it; but an offering of fire was to be presented to Jehovah (Lev. xxiii. 23–25). It preceded by 10 days the Great

TRUNK FISH.

Day of Atonement (27). In Numbers (xxix. 1–6), details are added as to the "offering of fire," which was to include the burnt offering, a meat offering, and a sin offering. The first of Tisri was New Year's Day of the civil year. It is still observed as a Jewish festival.

Trunk, an oblong box or bag constituted of wood, leather, or metal, used by travelers as a receptable for clothing and other personal belongings. In the 18th century few trunks or valises were needed as there was little traveling. The business of manufacture was then generally conducted by those who were saddlery and harness makers. In New York in 1840 there were 11 makers, and in 1901 there were five large factories whose sales amounted to 2,000,000. In the United States in 1900 there were 391 establishments engaged in the manufacture of trunks and valises, employing 7,084 persons and paying out $2,834,892 in wages. The cost of materials used represents an outlay of $6,045,387, and the value of produced goods $12,693,225.

Trunk-back. See LEATHER-TURTLE.

Trunk-fish. A variety of fish of the order *Plectognathi* and the sub-order *Ostracodermi.* See COFFER-FISH.

Trunk-hose, a kind of short wide breeches gathered in above the knees, or immediately under them, and distinguished according to their peculiar cut as French, Gallic, or Venetian. This garment prevailed during the time of Henry VIII., Elizabeth, and James I.

Truro, troo'rō, **Thomas Wilde,** BARON, English statesman: b. London 7 July 1782; d. there 11 Nov. 1855. He was educated at Saint Paul's School, studied law, and in 1817 was called to the bar. He was retained for the defense of Queen Caroline in 1820 and made himself famous by his conduct of the case. He entered Parliament in 1831, sitting for Newark-on-Trent, and continued to hold that seat until 1841, with the exception of the years 1832–5. He subsequently represented Worcester until 1850 when he took his place in the House of Lords. He was appointed Solicitor-General in 1839, and Attorney-General in 1841, though he occupied the latter office but a few months. He introduced Rowland Hill's postal reform plan to the House in 1843, and in 1846 was reappointed Attorney-General by Lord Russell, an office which he vacated a few days later to become chief justice of the court of common pleas. He was sworn as lord-chancellor in 1850 and at the same time was created Baron Truro. His career as chancellor was eminently successful, a fitting conclusion to his long and honorable career.

Trus'dell, Charles Gregory, American philanthropist: b. Montgomery, N. Y., 1 May 1826; d. Chicago, Ill., 16 Feb. 1903. He received an academic education, studied theology, and in 1857 was ordained in the Methodist ministry. He held various charges in Iowa until 1865, in which year he became presiding elder of the Iowa City district. He subsequently accepted the pastorate of a church in Chicago and preached there until the fire of 1871 when he was appointed to superintend the distribution of the relief fund. In this capacity he expended nearly $5,000,000 for the relief of the fire sufferers. The Relief and Aid Society was continued afterward for the benefit of the Chicago poor and Trusdell remained superintendent until his death. He was appointed presiding elder of Chicago in 1885.

Truss, in surgery, an appliance for the prevention of rupture or hernia (q.v.), or for keeping the injured parts in place when reduced. It consists of a pad of wood, hard rubber, or other hard material, or of soft rubber filled with water — a water-pad — for compressing the aperture through which the hernia protrudes. In an inguinal hernia this pad is held in place by a steel-spring band, or some metallic band molded to fit the inequalities of the body, passing wholly or partly about the hips, and assisted by a leather strap. Usually one or two pads are attached to the band posteriorly where pressure is exerted on one or both sides of the spine. A fair temporary truss may be made of a compress of cloth, cotton, oakum, etc., held in place by adhesive plaster and a spica bandage. An umbilical hernia may be kept in place by a pad, strips of adhesive plaster, and a cloth bandage. An ill-fitting, uncomfortable truss does harm, while a proper one not only affords comfort but is sometimes curative.

Truss, in architecture, a combination of timbers, or of iron-work, or of both together, so arranged as to constitute an unyielding frame. The simplest example of a truss is the principal or main couple of a roof, in which the tie-beam is suspended in the middle by the king-post to the apex of the angle formed by the meeting of the rafters.

Trust Companies. These distinctively American corporations, sometimes, in minds unacquainted with financial matters, confused with the so-called "trusts," exist throughout the United States and in two of its island possessions, Hawaii and the Philippines, deriving their powers from State and Territorial laws, save in the District of Columbia, where the authority and supervision of the comptroller of the currency of the United States obtain.

Powers and Rights of Trust Companies.— The general functions of trust companies, although differing in marked manner in various sections of the country, usually comprise, stating the powers somewhat in an order of importance, the following:

To receive and hold money on deposit, payable on demand or at some stated time, either to an individual depositor, as is the practice in commercial banks, or to those designated under the terms of either trust agreements or appointments by courts and others; to be, in the same manner as though an individual, trustee, executor, administrator, depositary, guardian (of estate, and in some States as curator or committee of person), receiver, assignee, or fiscal agent; to invest deposit funds in real and personal securities, accounting for the principal and income of such investments to owners or beneficiaries, and maintaining these, as a rule, both as to the trust investments and the relative bookkeeping, separately from the capital, surplus earnings and general deposits lodged with the trust company, these latter, as in banking business being partly retained in cash, partly invested in legally prescribed securities, or in real estate, and the remainder loaned upon collateral securities or discounted commercial notes; to act as trustee under corporate mort-

gages, countersigning issues of bonds of railroads and other corporations large and small; to act as registrar and as transfer agent of issues of stock, countersigning the stock certificates; to act as agent for the payment of coupons, and pay dividends in behalf of corporations which also employ the trust company as transfer agent; to pay interest upon deposits,—in so far as the funds may not need to be invested under the requirements of any trust.—to depositors who lodge their money with the trust company for long or short periods, a minimum rate of interest being paid, of course, on demand deposits subject to withdrawal by check. The larger and more conservative of the trust companies, however, particularly in the cities, do not pay interest on the deposit balances of those who are also commercial borrowers, while many trust companies decline entirely to discount notes, holding that this is a feature of commercial banking and should not be practised by trust companies.

In addition to the foregoing, it should be stated that under ordinary or special charter rights in certain of the States, trust companies are empowered to insure titles; to undertake, in the capacity of agent, the purchase, sale, and management of real estate; to insure fidelity risks; to receive valuables for safekeeping; to act as surety in legal causes; to become security for the faithful performance of any contract or individual act; to purchase and sell bonds and foreign exchange; to issue domestic and foreign travelers' letters of credit; to prepare and take the custody of wills; to issue debenture bonds against mortgage loans by the trust companies; to receive savings deposits, generally as a regularly prescribed power, but sometimes, in States where mutual savings banks also exist, the criticism has arisen that trust companies ought not to engage in this branch of banking business. In reply to this the financial strength and continued success of the trust companies are pointed to as arguments in favor of permitting the companies to engage even more generally in the receiving of savings accounts, always provided, however, that there be no conflict with the savings bank laws of the particular State.

Limitations of Trust Companies.—During recent years branch bank methods have been imitated by the trust companies. This has occurred in a few large cities only, and notably in New York. The main business at such branches is the receiving of deposits, but sometimes loans are granted and the less important matters of trusts, real estate management and other trust company operations are undertaken by this means, always, however, with general control from the home office.

Trust companies, by virtue of such powers as have been described, wider, as they are, than those of any other class of American moneyed institutions, have been given the appellation "the department stores of financial business." There are, however, numerous restrictions. They do not issue circulating notes, as do national banks, and as it was formerly the right of state banks to do. In some of the States they may not make investments beyond a certain percentage of their capital in any one issue of securities, usually 10 per cent. The same applies to loans to any one person. In some States loans are not made to directors, officers, agents, and employees, and the general rule is that trust companies are debarred from making loans upon their own stock. In some States deposits of some portion of the trust company's capital are required to be lodged with the State authorities, and specific investment of a portion of the capital funds is prescribed. In others deposits may not be received by a trust company to an amount exceeding 10 times its paid-up capital and surplus. In some States the stockholders are subject to double liability, as are stockholders of the national banks. In certain States, and often according to the clearing house regulations of many large cities, the trust companies are compelled to keep a cash reserve against deposits, usually equal to the percentage of reserve carried by banks clearing through the same clearing house. In recent years much controversy has existed as to the question of sufficiency of trust company reserves, the contention of the banks being that trust companies, particularly in large cities like New York, ought to maintain a more substantial measure of reserve than at present, even if not the percentages required of national and state banks, and the trust companies replying that, because so much of their deposit money is lodged with them in trust or under other conditions of inactivity, also because such large sums of cash are deposited by them with the banks, the reserve requirements imposed upon the trust companies ought to be much less than those asked of the banks. Growth and popularity of trust companies have given added value to the word "trust" as a part of a corporate title, and in some States within very recent years a wise prohibition has been enjoined against foreign business corporations using this word as part of their title. The law in New York State since 1904, for instance, has been that in the use of such a title, whenever the name shall be written, printed, engraved, or displayed, there shall be added to it in legible characters the words "Not a moneyed corporation."

Organization Arrangements.—The amount of capitalization and the number of directors naturally varies in accordance with State laws, but generally, of course, larger capital is required in the cities, as much as $4,375,000 being employed by one company in New York city, and the minimum of requirements under present laws for companies organizing in that city being $500,000. In Chicago one company has $5,000,000, and rarely, except in small towns, is less than $100,000 of capital permitted, the average throughout the country being about $300,000 per company. In New York city as many as 30 directors serve upon some boards, but from 5 to 15 is the customary number in most cities. From the larger boards of directors committees are chosen, with interim powers, exercised, as a rule, at weekly meetings, whereas the full board may assemble only monthly or quarterly.

The modern practice of forming trust companies almost invariably involves, as a safeguard, the payment into the companies' hands by the stockholders of an amount of paid-in surplus, the paid-in amount sometimes being equal to as much as 50 per cent of the paid-in par of the stock.

History and Growth.—Historically considered, we find trust companies appearing about

30 years after the organization of the first American bank. The Pennsylvania Company for Insurance on Lives and Granting Annuities was chartered in Philadelphia in 1812, although regular trust powers were not granted this company until several years later. Down to the time of the Civil War, numerous charters were granted, principally in the large cities in the East. Some of the companies engaged in fire insurance business, but their functions were mostly of a trust character, and generally they were forbidden the privilege of doing banking business in any form. The increase of negotiable securities, incident to the Civil War, and the consequent increase of the national debt, induced the establishment of safe deposit companies, which were first incorporated about 1866, thus making a new field for trust company development.

In New York city the oldest trust company, the Farmers' Loan and Trust Company, dates from February 1822, and this corporation seems to have been the first formed specifically for acting as trustee. Ohio trust companies date from 1834; Illinois companies from 1855; Massachusetts companies from 1869; New Jersey companies from 1875. About 1872 agitation arose as to whether this class of institutions ought not to be brought under some kind of stricter supervision than had previously obtained. The result was that in 1874 the New York State trust companies were brought under the direct supervision of the State superintendent of banking. Most of the States have since come to require periodical reports, and to-day in many States the trust companies are rigidly and regularly investigated, annually or oftener, by State examining authorities, the system being fully as thorough in some States as though the examinations were conducted by the comptroller who supervises the national banks.

In the early '80's a sudden and marked increase took place in the number of trust companies, about 200 organizations being effected during the 10 years ended with 1890, about 300 in the succeeding 10 years, more than 100 during 1901, about 150 in 1902, and 300 during 1903, until at the end of 1904, according to an unofficial compilation made early in the succeeding year, the total number of incorporated trust companies amounted to 1,441. Of these the notable numbers, by States, are: Pennsylvania, 290; New York, 85; Illinois, 69; Indiana, 65; Ohio, 62; New Jersey, 62; Tennessee, 54; California, 50; Massachusetts, 47; Iowa, 42; Texas, 41; while in every State, Territory, and island possession, except Alaska and Porto Rico, there is some form of trust company organization.

Incidental to this great growth many charters were obtained which have not been availed of, although there has by no means been a marked lessening in the popularity of this form of financial organization.

Comprehensive trust company statistics for the whole country had never been gathered until 30 June 1903, when, in New York, the United States Mortgage and Trust Company published and distributed gratuitously a collection of 912 companies' statements, with the names of officers, directors, and other data never before gathered as a whole, or even available in detail except in State reports.

On this date the 912 companies had combined resources of $2,910,063,340, of which $627,454,802 were investments in stocks and bonds, $1,548,225,457 in loans and notes, $435,159,584 in cash on hand and in bank, $173,928,964 in mortgages, $74,151,106 in real estate and banking houses. Among the liabilities were $2,175,863,770 of deposits, while the companies had aggregate capital stock of $317,292,175 and surplus funds and undivided profits of $362,601,767. With an aggregate of $3,000,000,000 of funds, they equaled in volume very nearly 50 per cent of the total funds held by the country's 4,959 national banks. Trust company resources in the city of New York exceeded $1,000,000,000 on the date named, as compared with national bank resources of $1,203,000,000. In certain cities there were more trust companies than national banks, and in a few, like Cleveland, Ohio, Newark and Jersey City, N. J., and Providence, R. I., trust company resources were in excess of those of the national banks.

The banking power of the world was estimated in 1904, by the comptroller of the currency at Washington, at $33,608,000,000, of which about $13,826,000,000 is banking power of the United States. With trust company resources of $3,000,000,000, it will be seen that these institutions comprise about 9 per cent of the world's and about 22 per cent of this country's banking power.

Suggested Control by Federal Government.—Seeing the growth of these institutions, and the diversity of their powers, the question has, during recent years, arisen as to whether the Federal government might not with advantage assume the control of the trust companies. A reason why this probably may not be possible of accomplishment during many years to come is that because of the breadth of powers, as hereinbefore described, when compared with the rather restricted character of business done by the national banks, it would be very difficult to establish even a uniformity of legal requirements. Some uniformity of laws as regards supervision has been much sought for, however, by the trust companies themselves, and the results which will eventually follow in this connection will doubtless be measured only by the skill and amount of organization existing in the banking departments of the different State governments. One solution which has been suggested, regarding the idea of national control, is that the national banks be permitted to broaden their scope so as to administer trusts, make real estate loans, and have other powers such as have always been granted to trust companies but not to national banks.

The payment of interest on deposit balances by the national banks, and on the other hand the receiving of savings deposits and other forms of miscellaneous banking operations by trust companies, both illustrating the growth and broadening of American banking methods in the last quarter of the 19th and the beginning of the present century, are proofs of successful achievements by the trust companies, and make the problem of broader powers for other banking institutions one requiring settlement in the near future, without involving that the main features of trust company operations need necessarily be curtailed.

Strength and Success of Trust Companies.—It is a curious and noteworthy fact that al-

though the competitive lines between banks and trust companies have come to be rather sharply drawn many directors in banks have latterly come to serve also in the directorates of trust companies. Moreover, as a proof of the success of modern trust company operations, it may be stated that in the esteem of public investors no class of securities are more highly regarded than trust company shares. The average bid price in the open market was computed in 1903 for certain different cities and States, as follows:

	Per cent of par.
New York City	556
Other New York State Companies	261
Philadelphia	242
Pittsburg	288
Chicago	233
Boston	247
Saint Louis	243
Louisiana	392
Georgia	293
New Jersey	245
Rhode Island	238
Maryland	213

Net earnings are correspondingly large. In 1904 three companies in New York earned over $1,000,000 each upon their capital; 17 Boston companies earned over 17 per cent on a combined amount of capital of $11,000,000; a Philadelphia company earned 33 per cent on $2,500,000 of capital; a Pittsburg company reported 302 per cent upon a capitalization of $1,500,000. Among the larger city companies, dividends of from 10 to 30 per cent are not unusual, and when taking into account the fact that usually substantial sums are carried to surplus or undivided profits accounts, in addition to the amounts disbursed in dividends, serve to explain the high market prices at which the companies' shares of stock change hands in the market.

Interest rates on deposits have ranged in recent years between 2 and 4 per cent, but the latter rate, excepting upon very long term deposits in trust, has not met with favor by the more conservative trust companies, the result of paying as high a rate as 4 per cent interest having been to conflict with savings bank rates and to place the trust companies sometimes in the unenviable position of seeming to bid for deposits in an unwarranted manner. Similarly, quite a degree of dissatisfaction has been felt by the banks in the larger cities on account of trust companies, when receiving out-of-town checks for collection, giving immediate credit for the amount to be collected, contrary to regular bank practice, and sometimes not charging the rates of exchange ordinarily expected by banks for the collection of these items. Trust company business, however, involving as it does more than mere interest profits, yields an income composed of the same legal commissions as are received by individual trustees, executors, etc., fees also for the registration of bonds at about 50 cents per bond; fixed annual sums for registering and transferring stock and paying coupons, amounting sometimes to many hundreds of dollars in the case of large issues, and usually with a minimum fee of $100. A principal source of income is profit upon holdings of stocks and bonds, the revenue of a company from sales of these, when the investments have been wise in their character, sometimes exceeding the income from all other sources. In addition to these, important underwriting commissions are frequently received by companies in the principal cities, when issues of safe and marketable securities require that temporary advances of large sums of money be made to syndicates of bankers and capitalists who need to employ such sums until their securities can be sold, and are willing to pay liberally for the accommodation. The charge has been brought that the trust companies have not always been wise in carrying on their underwriting operations, but the income results reached have been on an enormous scale, and complaints as to the unwise use of funds by the companies have been rarely reported.

Safety and Popularity of Trust Companies. —Trust company methods are mostly trustworthy and failures are of infrequent occurrence, which may be attributed to the fact not merely of large capital and surplus funds, but to able management by a number of trained financiers as officers, charged with responsibilities which too often, in banks, particularly the smaller ones, are entrusted to one or two men. Such failures as have occurred have been, as a rule, due to unwise loans on Western mortgages and to other operations, carried on at distant points; sometimes through depreciated securities or excessive loans, but never with a single exception or two, by reason of official malfeasance.

The American Bankers' Association has for a number of years recognized the trust companies, a trust company section having a part in the association's annual deliberations and otherwise working in great harmony with the representatives of national, state, and savings banks. In two States, New York and Pennsylvania, there are State associations, devoted to the furtherance of trust company interests, while in the companies everywhere there are employees' associations. The purposes of these latter are an interchange of ideas, the saving of money, and the investment of funds for the mutual benefit of members, but the officers of the trust companies, while generally overseeing such association work, do not share in the advantages of membership.

The American trust company has been copied after in some other countries. Seventeen concerns in the Dominion of Canada have various powers similar to companies in the States. Their business is, however, more in the nature of executing trusts than in doing a general deposit and banking business. A trust company in the province of Manitoba has in fact been expressly prohibited from receiving deposits. In England, Scotland, France, Australia, New Zealand, South Africa, and Mexico, companies more or less on the American plan have been formed. An announcement was made in Japan early in 1905 of a proposed trust company organization in Tokyo. In all of these companies there has been much imitation of American methods rather than a patterning after the trust and other methods exercised by the Continental mortgage banks, credit societies of France, and agency firms of India, all of which bear some resemblance to the American trust company plan.

The United States enjoys present financial success and faces possibilities of even greater

future wealth, with no one more serious economic problem before it than the providing of safe and profitable means of employing the money of its people. The trust company has been likened to the holder of the talents, and its fiduciary character and broad scope make it a most potent influence, rendering as it does an account of stewardship to the entire financial public. During nearly a century it has seldom been found wanting at any time, and the healthy growth, which is an evidence of the standing of the trust company in the public mind, as well as its phenomenal financial success, indicated by the earnings and the volume of assets as compared with the banks, make it seem that the prospects are limitable only by the future success of America's other great economic institutions, among which it has its own and important part.

EDWARD T. PERINE,
General Manager The Audit Company of New York.

Trustee', in law, a person to whom property is legally committed in trust, to be applied either for the benefit of specified individuals or for public uses. The person for whom or in whose favor the trustee holds the estate, or any interest therein, is called the *cestui que trust.* Trusts are generally raised by marriage settlements or by wills. The ordinary trusts in the former case, as to real estate, are, in the first place, for securing to the wife payment of her pin-money during marriage, and of her jointure on her becoming a widow; then for raising the stipulated provisions for younger children, and also for providing for their maintenance while minors. Trusts are commonly raised in wills for the maintenance or advancement and portioning of children. Trustees may be declared verbally as regards personal estate, but as to land writing is necessary. No one is compelled to undertake a trust, but if he once accept he cannot renounce it unless the trust-deed contains a provision enabling him to do so, or by the consent of all those beneficially interested in the estate. Trustees are bound to act in strict accordance with the terms of the trust, and are liable for the consequences of any breach of trust. However, courts may relieve a trustee from personal liability, either wholly or partly, if he has acted honestly and reasonably. They are accountable for the interest which they do or might make from the employment of the money in their possession, as also for the whole profits they may derive from trading with the trust fund. As their office is considered purely honorary, they are not entitled to any allowance for their trouble in connection with the trust. Trustees are liable for any misapplication of the trust fund arising either from ignorance of facts which they might by common diligence have known, or from ignorance of the law in any case, even though they may have acted in good faith and in reliance on the opinion of eminent legal advisers; but they may apply for advice by petition to a judge or by summons to a judge, and so be absolved from responsibility. The estates of trustees deceased are liable in the case of fraudulent administration. The appropriation of the trust fund by the trustee to his own use makes him liable to prosecution and punishment by imprisonment.

Trusts.—*The Trust Defined.*—What is a trust? The question is easily put, but not so easily answered. For, while answers are easily forthcoming, they are so diversified in character, even among men who are supposed to think along the same lines, that they usually result in only adding more confusion to an already much-confused subject. Thus, James B. Dill, the eminent corporation lawyer, has defined the trust as "a dominant combination of money, property, business or commercial power or energy," and Charles R. Flint defines it in this wise: "A combination of labor is a trades-union; a combination of intelligence a university; a combination of money, a bank; an industrial combination is a combination of labor, intelligence and capital—work, brains, and money." But to quote the more practical words of S. C. T. Dodd, solicitor of the Standard Oil Company, who, as a student of and acknowledged authority on the characteristics of the modern trust movement, seldom shuffles in his definitions or hesitates in his logic, we find that "The term 'trust' in its more confined sense embraces only a peculiar form of business association effected by stockholders of different corporations transferring their stocks to trustees. The Standard Oil Trust was formed in this way, and originated the name 'trust,' as applied to associations. . . . The term 'trust,' although derived as stated, has (now) obtained a wider signification, and embraces every act, agreement, or combination of persons or capital believed to be done, made, or formed with the intent, power or tendency to monopolize business, to restrain or interfere with competitive trade, or to fix, influence, or increase the prices of commodities." That definition, first written many years ago, still seems to be the best known brief definition of the Trust. As explained, the original conception of the term was a limited one, and when used in that sense, it is not at all applicable to the industrial or other business combinations of to-day. But in the usage of to-day, the term "trust" is applicable to any act, agreement or combination believed to possess the intention, power or tendency to monopolize business, interfere with trade, fix prices, etc. It will be noted that this embraces those enterprises which are popularly believed to have this intent, power or tendency, and not merely to those which have, by demonstration, been shown to be possessed of such power. Thus not only are consolidations of former competing plants to be looked upon as trusts, but all large businesses which possess or are believed to possess the foregoing characteristics are trusts, whether made up of one plant or a hundred, and whether actually possessing monopolistic features or not. Thus, franchise corporations and groups are trusts; railroad aggregations are trusts; possessors of exclusive powers or privileges of any sort, as well as mere producers on a large scale, must be looked upon as trusts. If there is any qualification at all in the public mind as to the correctness of the above definition, it is merely that the thoroughgoing trust must be characterized by largeness. Very small corporations, even if they possess monopolies, are not popularly called trusts.

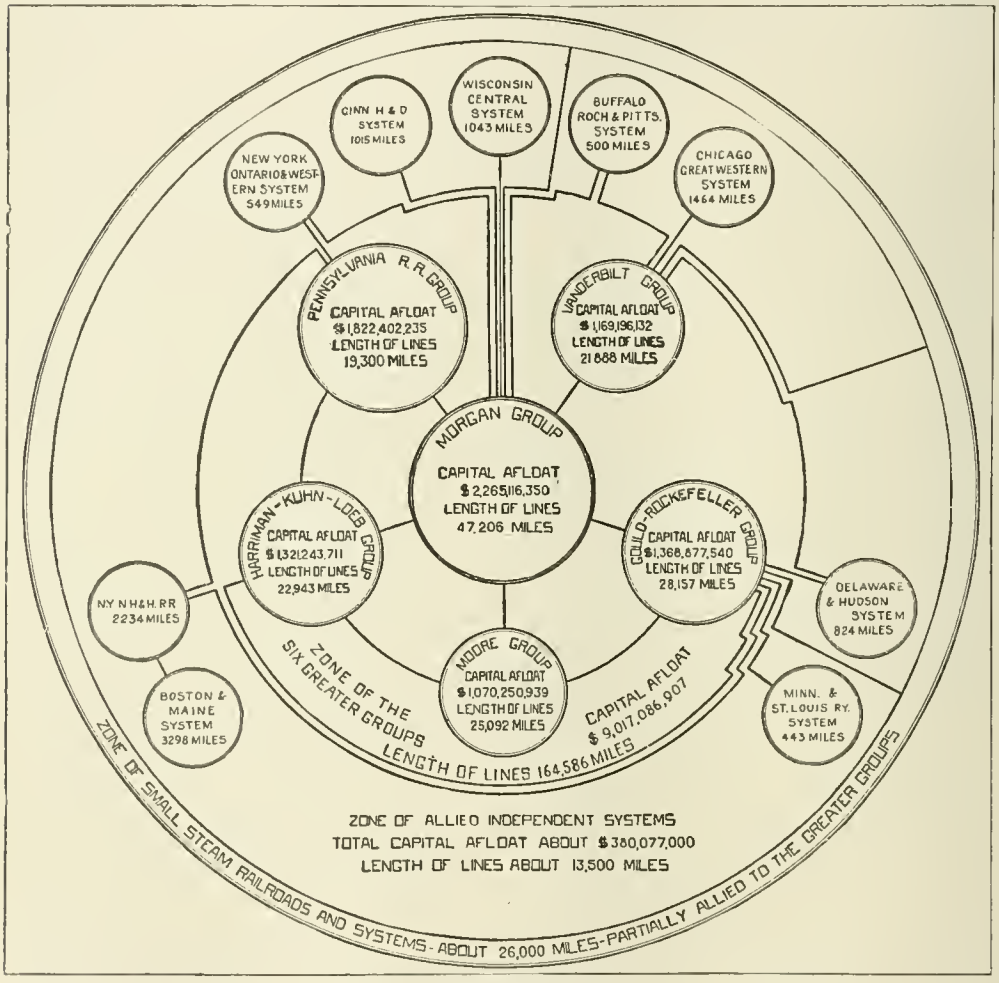
The Trust and Monopoly.—The word "trust" is necessarily closely allied with the term "monopoly." Everywhere are discussed together the evils of trusts and monopolies. Almost universally the term is used in an opprobrious sense, and in the popular mind the terms have

various interchangeable meanings, such as "predatory wealth," "money-power," etc. The public has become largely imbued with the belief that a monopoly is a menace to their general welfare, and this idea has, of course, been persistently kept to the front by a large element of writers and thinkers. On the other hand, a more conservative element, and particularly those known as the "capitalist class," persistently insist that there is no such thing as monopoly in modern industrial and commercial life, except in a very limited way. For instance, it is claimed that while patents may be monopolies in a qualified sense, yet, in view of the fact that the granting of a patent confers a benefit on the community, it should therefore be accorded a definition which is not so universally unpopular and "vicious" in its meaning. The natural result of this situation is that there exists a lack of sincerity on all sides over the meaning and application of this term. The average critic of the modern industrial system sweepingly calls everything of a wealth-producing nature a monopoly, whereas the actual employees of monopoly-power often deny the existence of such an element, and it is this probable lack of frankness, or at least of a clear understanding of the real meaning and signification of the term, which is probably at the bottom of much of the heedless discussion which is continuously going on.

Monopoly is not combination itself; the monopoly element, if there be any, is something distinct from the mere organization or trust. When men form corporate organizations or make agreements, they do not form monopolies.

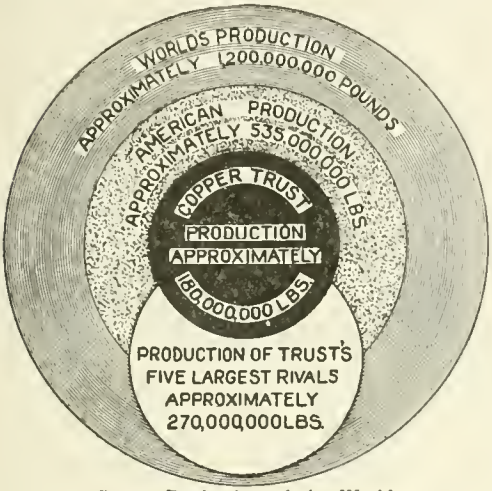
THE GREAT STEAM RAILROAD GROUPS.

Chart Indicating the Remarkable Concentration of Control, Interdependence and Alliance of the American Steam Railroad Interests.



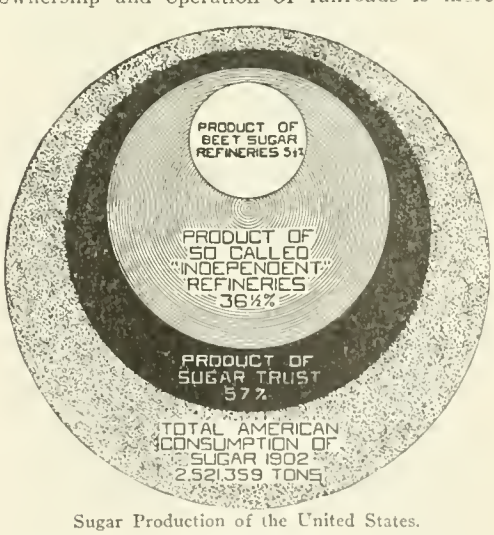
Explanation.—Starting with the centre, or Morgan Group, we can directly trace its alliance with the other great groups, and also both the direct and indirect connections with the smaller railroad consolidations and interests of the Nation.

They may take advantage of monopoly in one way or another, but they do not create it. The monopoly itself is rather a social product, which exists with the consent of society, and men in business take advantage of it where found, just as they take advantage of any other factors for the purpose of achieving their ends. For example, it is first found that in the production of steel rails, better results can be obtained by purchasing raw material in enormous quantities,



Copper Production of the World.

even at the risk of tying up much capital; and later, it is proven to be still more economical and advantageous in the long run to actually own the raw materials, even to the ore in the mountainside; and so the same tendency continues until the most profitable condition is reached, when the great aggregate of all producers combine in harmony and absorb all the raw materials or sources of supply, with which they may almost exclusively supply the entire market with the finished product. Thus we see here illustrated a condition of society which men take advantage of to their direct benefit. In the absorption and exclusive possession of the source of supply is the securing of the monopoly. Without the possession of this source of supply the steel industry would have no permanent monopoly, for an effective use of monopoly consists in practically the exclusive use or possession of it. Examined in this way it will be found that, while all large businesses are not necessarily monopolies, yet the element of monopoly is frequently an important feature in a large business or industrial enterprise, and is often one of the chief factors making for stability and success. A monopoly, then, is a special advantage or privilege either natural or artificial. Governments confer monopoly-power, but society itself creates monopoly. Even government itself, a creation of society, may in a sense be called a monopoly. Patents, copyrights, franchises, tariff benefits, the privilege of holding land out of use and all like benefits are governmentally conferred monopoly-powers; rights of way of transportation companies, terminal sites and coal, iron and other ore deposits are socially created or natural monopolies. Monopoly is a fundamental and universal factor in modern life, but seems to be little understood, hence the agitation against it is frequently characterized by unfairness and superficiality. Men rail against a vague thing which they call "monopoly," and yet they do not usually know the real signification or meaning of the term. For it is a fact that the mass of mankind are monopoly-seekers in one form or another; they are all seeking for benefits or advantages. Men naturally seek to gratify their desires with the minimum of effort, and when they can make any sort of a "short-cut," they generally do it. This is one of the fundamental tendencies of civilization, and any sentiment or agitation which does not reckon with this natural tendency will prove both futile and ineffective. Such laws as the Sherman anti-trust act prove little more than toys in the face of these natural tendencies; a fact which is proven by the experience of our anti-trust legislation of the past twenty years. Almost everywhere in trust circles it is pointed out that success in modern business involves these "short-cuts." And this claim certainly seems to be verified very strongly in the modern trust movement, which has been so largely a result of the desire and necessity to eliminate waste and to economize in the securing of results. These so-called "short-cuts" in business methods are made in many ways, and men are constantly breaking through the lines of abstract justice to achieve their ends. Where they do this, society often appears to endorse these methods on the general theory that the end justifies the means. It is claimed that while the unwise use of monopoly-power would of course tend to operate injuriously to society, yet judiciously administered, the element of monopoly is a vast benefit, both to the public and to its possessors. Thus, while railroad companies are the beneficiaries of a natural monopoly, it is argued that the private ownership and operation of railroads is more



Sugar Production of the United States.

advantageous to the public than would be their public ownership and operation. This, of course, is an open question. We may, however, safely say that monopoly does exist; that it is recognized as the great characteristic in nearly all so-called "trusts," and that it is a factor of such moment in our social life that it cannot be

eliminated by the advocacy of superficial restrictive legislation, such as has recently become so popular, any more than the sunlight itself can be regulated by statute. In conferring on government the right to superintend and supervise the production and distribution of wealth, we do not eliminate monopoly; we only concentrate monopoly the more into the hands of the few

Growth of the "Telephone Trust."

—the ultimate goal of which is the ideal of the socialist, to make the government the exclusive possessor of all monopoly, of all wealth, and even of man himself.

Magnitude of the Trusts.— In the matter of capitalization the greater industrial trusts of the United States, of which there are at the present time (1904) seven, are represented by an aggregate of outstanding stocks and bonds (par value) which reaches no less a total than $2,662,752,100. Of this amount, over one half, or $1,370,000,000, is included in the capitalization of the United States Steel Corporation and its subsidiary companies. These greater industrial trusts have all been organized since 1898, with one exception (the Sugar Trust), and all are incorporated under New Jersey laws. They represent an aggregate consolidation of over 1,500 distinct plants. Of the lesser industrial trusts, there are in active existence 298, with a total par value capitalization of $4,055,039,433. These 298 trusts represent consolidations of over 3,400 original plants. Adding various reorganized trusts, the aggregate capitalization outstanding in the hands of the public of 318 important and active industrial trusts in this country is at the present time no less than $7,246,342,533, representing in all, consolidations of nearly 5,300 distinct plants, and covering practically every line of productive industry in the United States.

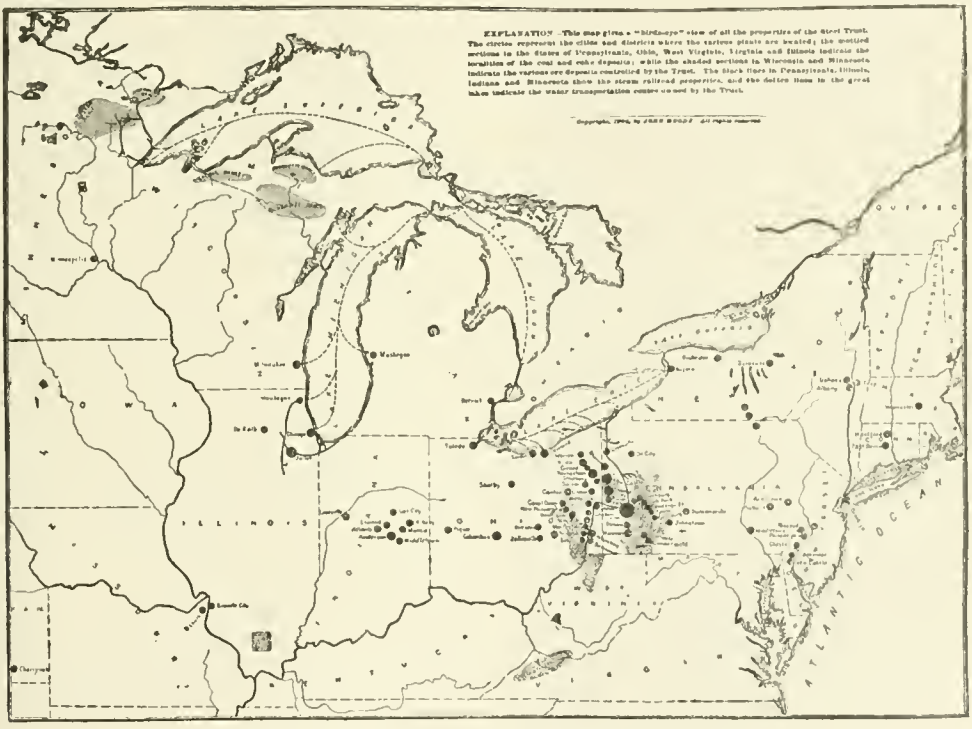
The Chief Characteristic of the Trusts.— To view the immense aggregation of over $20,000,000,000 of consolidated capitalization, nearly all of which has taken the trust form within the last decade, is to at once raise in the mind the all-important problem as to what is the underlying cause of this seemingly irresistible tendency toward business centralization. For there must clearly be such a cause, and a deep-lying one. For many years, so-called authorities have been busily creating and applying remedies for the speedy removal of the trusts. And still the trust movement has seemed all the time to plunge forward with accelerated speed, and there appears to be little in sight as yet to frustrate it in the slightest degree. In spite of all this babel of discussion, accusation and crimination, the writer believes that the trust-doctors and "trust-busters" are for the most part as far from the real cause and real remedy as daylight is from darkness. Instead of the growth of the trust movement being an achievement to be laid at the door of Mr. Morgan or Mr. Rockefeller, or any other leader of men, it should be laid at the door of nature. For if anything in this world is true, the following proposition is:

The modern trust is the natural outcome of evolution of social conditions and ethical standards which are recognized and established among men to-day as being necessary elements in the development of civilization. The above definition does not necessarily imply, however, that social conditions or ethical standards are entirely what they should be. The ethical standards which appear to justify certain features of the trust movement may be false; and insofar as they have contributed any vicious or unjust characteristics to the working of the trust tendency, they certainly are false. Now, while all successful trusts are not monopolies, all successful and permanent ones which are capitalized on anything but a free-competitive basis, do at least embrace elements of monopoly. For monopoly is one of the necessary assets in modern methods of financing; it is an element that reaches far down and makes its influence felt in every walk of life, and is, if not directly, at least indirectly,

Growth of the "Tobacco Trust."

one of the great factors which makes for concentration throughout all civilized society. Business could not be carried on under present methods without at least a tacit recognition of the legitimacy of the monopoly-factor. The natural law which engenders monopoly is fundamental. That men naturally seek to gratify their desires with the least exertion is a fundamental

truth, and the experience of all civilized society demonstrates it. And as men have gradually become more civilized, their minds have been exerted more and more to devise "short-cuts" to achieve their aims. Thus, machinery and all other economical factors for production have reduced time and labor to a minimum, and in matters of business method, economy in commerce and finance, men have irresistibly gravitated from expensive to economical modes of labor, from small to large-scale means of production and distribution. This tendency, working through many generations, has finally brought mankind to the present civilized condition of society. Reasoning along the same line, we find that this same tendency has been the creator of and is the underlying cause of monopoly and the modern trust. For man, in



Properties Controlled by the United States Steel Corporation.

seeking to accomplish his purposes quickly, simply and cheaply, has, as pointed out above, ever been alert to the possibilities of economy in method through the seeking of "short-cuts." It is his desire to achieve at all hazards, and in all ways; it was this inherent tendency which was the creator of competition, which came later in commerce and industry, to be known as the "life of trade," and, therefore, of commercial society itself. And, up to a certain point, it certainly was true that competition was the life of trade. But not so beyond that point. For quite early in the modern commercial and industrial life of men it was discovered that there were advantages to be gained in the adopting of methods somewhat different from those in vogue under the old regime of competition. By combining together and acquiring, either as a result of this joint effort or otherwise, a special privilege or "monopoly," men found they could accomplish the same ends far more cheaply and satisfactorily than in the old ways, and do so without the same exposure to what was frequently expensive and costly in the field of competition. It was then that men began to first cultivate this element of monopoly, with the result that it was not long before the more aggressive recognized the importance of the monopoly feature and hastened to take full advantage of it. Coincident with the active working of this new element in our modern life, concentrated industry grew with great rapidity; commerce took on greater strides; great enterprises controlled by greater minds came into being; wealth grew with wonderful rapidity, and instead of being distributed as before, began to be put to use under the method of concentrated capital, and through the effective and concentrated control of the master minds at the head of the gigantic industries, a point has been finally reached where wealth to-day is accumulated and massed with greater aggregate result than ever before in the history of mankind. And this condition has been largely brought about by the existence of monopoly power. As before stated, this monopoly element is not merely the product of a tariff or of other so-called "class legislation." It is far more fundamental than that. While it is true that patents are monopolies, and the protection of an industry by a tariff fosters a monopoly, so also is a railway or gas franchise a monopoly; railroad terminals and rights of way are monopolies; building sites are monopolies; the National Banking Law creates a monopoly; exclusive grants of land and steamship subsidies are monopolies. The

fact is, we find the element of monopoly all about us, and how modern civilization is going to get away from it or even retrench it by the passage of ineffective laws is, in the light of the foregoing facts, an exceedingly intricate question. The anti-trust legislation which has thus far been tried or broached in this country would appear to be singularly inefficient and beside the point. It does not seem to be in any sense in conformity to the spirit of modern tendencies and conditions. It aims merely to prick the pimples of the social problem rather than to go to the root of things. For when we realize what monopoly is, its depth and width and general position in modern industrial and commercial life, we can readily see that any kind of legislation aiming to abolish or materially retrench monopoly would have to be far-reaching and radical in its effects and would constitute a practical revolution in the bases of modern society. Whether one may regard monopoly as a curse or a blessing it is too deeply rooted in civilized society to be whisked away with a broom. The solution of the trust question really embraces, however, nearly the whole problem of modern industrial society. And in treating this problem from the point of view of not one interest nor one class of citizens, in viewing it from the standpoint of the ordinary citizen as well as from that of the capitalist and investor, we must necessarily bear in mind two fundamental facts. The first of these facts is that large-scale and economic production is the outcome of a natural evolution and has undoubtedly come to stay. The other fact is that concentration and exclusive financial control are chiefly the result of monopolistic conditions which are themselves an evolution from customs and ethical standards which, whether true or false, have for a long time been regarded as justifiable or necessary by an apparent majority of our citizens. That the evils of the trust and of monopoly are many, goes without saying, and the solution of the problem is a most serious one; but whatever steps men may take to counteract these evils, it should never be forgotten that the chief considerations are the preservation of equal individual liberty, and the free working of natural economic laws.

Consult: Bemis, 'Municipal Monopolies' (1899); Bridge, 'Inside History of the Carnegie Steel Company' (1903); Brooks, 'The Social Unrest' (1903); Chicago Conference on Trusts, 'Complete Report' (1900); Clark, 'Control of Trusts' (1901); Collier, 'The Trusts' (1900); Dodd, 'Combinations, their Uses and Abuses' (1894); 'Trusts' (1900); Dos Passos, 'Commercial Trusts' (1901); Ely, 'Monopolies and Trusts' (1900); Hadley, 'Railroad Transportation' (1885); Hobson, 'Evolution of Modern Capitalism' (1894); 'Inside View of Trusts' (1900); Inter-state Commerce Commission, 'Annual Reports' (1887–8); Jenks, 'The Trust Problem' (1900); Lloyd, 'Wealth against Commonwealth' (1894); Meade, 'Trust Finance' (1903); Meyer, 'Railway Legislation in the United States' (1902); Montague, 'Rise and Progress of the Standard Oil Company' (1903); 'Trusts of To-day' (1904); Moody, 'The Truth about the Trusts' (1904); Parsons, 'The City for the People' (1901); Stickney, 'State Control of Trade and Commerce' (1898); Tarbell, 'History of the Standard Oil Company' ('McClure's Magazine,' 1904); 'The Trust, its Book' (1902); United States Industrial Commission, 'Report' (1900–2); Von Halle, 'Trusts or Industrial Combinations and Coalitions in the United States' (1895).

JOHN MOODY,
Author of 'The Truth About the Trusts.'

Truth, Sojourner, American negro lecturer: b. Ulster County, N. Y., about 1775; d. Battle Creek, Mich., 26 Nov. 1883. She was held in slavery even after its abolition in the State. In 1827 she escaped, discarded the slave name Isabella, and chose the above fanciful appellation — Truth — as the substance of her message, and Sojourner because it was divinely revealed. Though quite illiterate, she spoke with some effect on emancipation and other reforms. Consult 'The Narrative of Sojourner Truth' (1884).

Truxillo, troo-hēl'yō. See TRUJILLO.

Truxton, trŭks'tŏn, **Thomas,** American naval officer: b. Long Island, N. Y., 17 Feb. 1755; d. Philadelphia, Pa., 5 May 1822. He was impressed into the British navy in 1767, and in 1776 was offered a commission which he refused in order to enlist in the cause of the colonies. He was appointed lieutenant in the American navy in 1776, and assigned to the Congress, equipped and commanded the Independence in 1777 and was later in command of the Mars with 20 guns. He cruised about the English Channel, greatly damaging the British merchant marine, and in 1781 was appointed to command the Commerce with 30 guns. His engagements throughout the war were uniformly successful. After the conclusion of peace he was employed for several years in the West India trade, but in 1798 upon the organization of the United States navy he was appointed one of its six captains and assigned to the frigate Constellation, with which, in 1799, he captured, after a severe battle, the powerful French ship L'Insurgente, and in 1800 La Vengéance. He was made commander of the West India squadron in 1801 and in 1802 was appointed to command the expedition against Tripoli, but he retired from the service in that year. He wrote: 'Remarks, Instructions, and Examples relating to Latitude and Longitude, also the Variation of the Compass' (1794).

Tryon, trī'ŏn, **Dwight William,** American painter: b. Hartford, Conn., 13 Aug. 1849. He studied art at Paris under De la Chevreuse, Daubigny and Guillemet. He has been awarded numerous medals, and other testimonials to his skill and success as one of the foremost landscape painters of this country.

Tryon, Sir George, English naval officer: b. 4 Jan. 1832; d. off Tripoli 22 June 1893. He entered the navy in 1848, served in the Crimean war, in 1861 became commander of the Warrior, the first British sea-going ironclad, and in 1874–7 commanded the Raleigh. He was secretary of the admiralty in 1882–4, became vice-admiral in 1889, in 1891 was appointed to command the Mediterranean station, and in 1893 perished in the flagship Victoria in collision with the Camperdown, due to his error during naval manœuvers off Tripoli.

Tryon, George Washington, American conchologist: b. Philadelphia, Pa., 20 May 1838; d. there 5 Feb. 1888. He was educated at the Friends' School of Philadelphia, and in 1865 originated the movement for the construction of

the present edifice of the Philadelphia Academy of Natural Sciences. In 1865–71 he was the editor of the 'American Journal of Conchology' 1865–71. His publications include 'Synopsis of the recent Species of Gastrochænidæ' (1861); 'Monograph of the Order of Pholadacæ' (1862); 'Monograph of Terrestrial Mollusks of the United States' (1865); 'Land and Fresh-Water Shells of North America' (1873); 'American Marine Conchology' (1873); 'Structural and Systematic Conchology' (3 vols. 1882); 'Manual of Conchology' (12 vols. 1879–85); etc.

Tryon, William, British colonial governor in America: b. Ireland about 1725; d. London 27 Feb. 1788. He served with ability in the British army, arrived in North Carolina as its lieutenant-governor in 1764, succeeded Governor Dobbs on the latter's death in 1765, and in 1771 was made governor of New York. In both colonies he was noteworthy chiefly for the cruelties of his administration. In North Carolina he suppressed the Regulators (q.v.) and displayed much inhumanity toward his prisoners. During the Revolution he led in person expeditions which destroyed the Connecticut towns of Danbury, Fairfield, and Norwalk. In 1778 he resigned and went to England, where he became a lieutenant-general in 1782.

Trypet'idæ, the family of fruit-flies (q.v.).

Tsar, tsär. See CZAR.

Tsaritsyn, tsär-ĭt'zĭn, or **Zaritzin,** zär-ĭt'zĭn, Russia, in the government of Saratov, on the Volga, 230 miles northwest of Astrakhan. It contains the remnants of old fortifications, a castle, seven churches, a mosque, theatre, schools, banks, etc. It is a railway centre and has numerous factories. It carries on a brisk transit trade in naphtha, corn, timber, fish, salt, wool, and metals, in the country included between the Don and Volga rivers. Pop. (1897) 55,967.

Tsarsko-Selo, tsär-skō'ĭ sā'lō, or **Zarskoje-Selo** ("Czar's Town"), Russia, a town in the government of Saint Petersburg, 14 miles south of the capital, with which it is connected by rail. It is the favorite summer residence of the imperial family, and was founded by Peter the Great. In 1744 the Empress Elizabeth erected the magnificent palace, which Catharine II. decorated at great expense. The principal front is about 1,000 feet long. The interior is gorgeously ornamented, the walls of some of the rooms being covered with amber, mother-of-pearl, jaspers, agates, and other precious stones. This palace has not been for many years the residence of the imperial family; they have preferred a less pretentious building, erected by Alexander I. The palace grounds, which are 18 miles in circumference, are finely laid out, and offer every variety of landscape. Pop. (1897) 55,967.

Tschaikowsky, chī-kŏf'skĭ. See TCHAIKOVSKY.

Tschermigite, chĕr'mĭ-gīt, native ammonia alum. It occurs at Tschermig, Bohemia, in white, fibrous masses, vitreous in lustre, transparent or translucent, with a hardness of 1 to 2, and a specific gravity of 1.50. It is a hydrous sulphate of aluminum and ammonium. It is extensively manufactured from the residues of gas works and is used as a substitute for potash alum.

Tschudi, Ægidius or Gilg, Swiss historian: b. Glarus 5 Feb. 1505; d. there 28 Feb. 1572. After receiving an education at Basel, Vienna, and Paris, he traveled for a time and served in the French army 1536–44. He was the chief magistrate of Glarus in 1558, but on account of his opposition to the Reformation, the spread of which he attempted to suppress by force of arms, was banished in 1562. He was recalled in 1564 and spent his remaining years in arranging historical matter which he had collected. His 'Die uralt wahrhaftig alpisch Rhetia' was published as early as 1538, but his chief works, the 'Schweizerchronik' or 'Chronicon Helvetiorum,' covering the time from 1100 to 1470 and the 'Beschreibung Galliæ Comatæ,' were not printed till 1734–6.

Tset'se-fly, an African gadfly (*Glossina morsitans*), noted for the deadly effect of its bite in many cases on all warm-blooded animals. It is about the size of a house-fly, brown, with a few yellow stripes across the abdomen. The symptoms are at first those of a severe cold; the eyes, nose, and mouth begin to "run," the body then swells, while emaciation sets in. The harm done does not result from a poison in the mouth of the fly, as formerly supposed, but from the communication to the blood of the victim of a microscopic blood-parasite similar to that of Texas fever (q.v.), which it has received from a diseased animal and carried to another. Tsetse-flies not themselves infected with parasites are thus harmless. Cattle and other animals which recover from the disease are usually immune, and attain a similar immunity after residing for a time in South Africa. The great dread of this fly formerly entertained has therefore proved to be unjustified.

Tsimshian, tsĭm-shē-ān' ("people"), a group of North American Indian tribes, forming the Chimmesyan linguistic stock, residing between the Nass and Skeena rivers, British Columbia, together with the adjacent territory and the islands off the coast. They subsist chiefly on the products of the rivers and the sea, especially salmon and oolachen, the latter furnishing large quantities of oil. They also hunt bear, mountain goats, and other large game, the horns of the goats being carved into spoons and ladles which are used in their communal feasts. They also make dug-out canoes, but most of their boats are purchased from the Haidas. Their houses are constructed of immense cedar beams and planks and often are large enough to accommodate a hundred persons, who are presided over by a house chief. Each family and town also has its special chief. The population of the tribes forming the stock is about 4,100, including about 950 forming Duncan's colony at New Metlakahtla on Annette Island, Alaska. The principal tribes are the Nass and the Tsimshian proper.

Tsi-nan-fu, tsē'nän'foo', China, the capital of the province of Shan-tung, situated near the south bank of the Hoang-ho River, 220 miles south of Peking. Pop. 300,000.

Tsitsikar, tsēt-sē-kär', Manchuria, a town in the province of Hilung-Chiang, situated on the Nanni, a branch of the Sungari River, near the Mongolian frontier, 470 miles northwest of Vladivostok. It is an important station on the Eastern Manchurian Railroad, has large fairs and a considerable traffic in furs and grain. Pop. about 30,000.

Tsu-Shima, tsoo-shē′mä, Japan, an island in the Korea Strait, about midway between Korea and the Japanese island of Iki Shima. It is 50 miles long by 10 miles wide, and almost cut in two by a deep bay. Pop. 38,636.

Tsung-li-yamen, tsoong′ lē′ yä′mŭn, the name of the department of foreign affairs in the Chinese government. See CHINA.

Tuam, tū′am, Ireland, an ancient town in the county of Galway, Connaught, 126 miles west by north from Dublin. It is the seat of the Roman Catholic archbishop, and of the Anglican bishop of Tuam. Its principal edifices are the Protestant and Roman Catholic cathedrals, the bishop's palaces, the college of Saint Jerlath, for the education of Roman Catholic clergy; the court-house, national and other schools. The manufactures are confined to canvas and a few coarse linens, but the trade in grain is considerable. Pop. (1901) 2,896.

Tuamotu, twä-mō′too, or **Paumotu** (pow-mō′too) **Islands, or Low Archipelago,** Polynesia, a group of islands in the Pacific Ocean, belonging to France, and situated between lat. 14° and 25° S., and between lon. 124° and 148° W., south of the Marquesas Islands, and east of the Society Islands. The group consists of about 80 atolls with a combined area of 366 square miles. They are, with a few exceptions, of low coral formation, and the surrounding waters are beset with reefs. Cocoanuts, yams and bread-fruit, and pearl, are about the only products. Pitcairn and Ducie Islands belong to Great Britain; the rest are French, and administered from Tahiti. The group was discovered by Quiros in 1606, and came into the possession of France in 1881. In 1903 a severe storm and flood visited the islands and many of the inhabitants perished. Pop. about 5,000.

Tuaregs, too-ä′rĕgz, **Tuaricks,** or **Tawarek,** a fierce and powerful race of Berber origin, professing to be Mohammedans, but different in their practices, religious and social, from most of the believers in that faith. They are virtually independent, although roaming within the boundaries of several jurisdictions, French, Turkish and Moroccan. The tribe is often predatory, and members of it have been guilty of grave outrages on travelers in the desert. Both men and women are of fine physique, and the women go unveiled, and take part with the men in the public affairs of the tribe. Tuareg is the Arabic name for the tribe. They call themselves Imoshagh. See BERBERS.

Tuatera, too-ą-tā′rą, the native name of *Sphenodon punctatum,* a large lizard-like reptile formerly abundant on the mainland of New Zealand, but now restricted to some of the small islands off the coast and probably doomed to total extinction. It is the sole living representative of the order *Rhynchocephalia* and because of its great zoological interest as a relic of that ancient group should be preserved, and, indeed it is protected by the Colonial Government. It is about 2 to 2½ feet long, with four strong, 5-toed limbs, a loose-fitting scaly skin and a fringed crest extending from the head to the tip of the tail. In color it has olive sides and limbs with minute white specks, beneath yellowish; the spines of the nuchal and dorsal crests yellow, of the caudal brown.

The teeth are completely coalesced with the jaws and palate to form two tuberculate ridges on each side posteriorly in the upper jaw, and a very hard polished beak in the front of the mouth. Most interesting skeletal features are the presence of two well developed post orbital arches in the skull, the firmly-fixed quadrate bone, the long series of abdominal ribs and the presence of separate intercentra between the vertebral bodies. On the roof of the skull in the parietal bones is a conspicuous opening, the seat of the pineal eye, which in this animal reaches a high degree of development, but is shielded from the access of light rays by a heavy curtain of pigment which covers it.

These animals live in burrows which terminate in large chambers lined with grass. Certain species of petrels occupy the tuateras' burrows as nesting sites, and the two are reputed to live peacefully together. During the day the tuatera sleeps in its nest but issues at night to seek its exclusively animal food, which consists of insects, lizards, frogs, small birds, earthworms, etc., or along the seashore of crabs, marine worms and small fishes. They are pugnacious but sluggish creatures, and are very fond of lying in water. Sometime during the summer, from November to January, about a dozen eggs are deposited in a hole in the ground, and there they remain for about 13 months when, during the following summer they hatch. Consult Howes, 'Transactions Zoological Society of London,' Vol. XV.

Tuba, in music, a brass wind instrument, the lowest as to pitch in the orchestra; it has five cylinders, and its compass is four octaves. Also, a high pressure reed stop of eight foot pitch on an organ.

Tubbs, Frank Dean, American educator: b. Mexico, N. Y., 9 April 1864. He was graduated from the Ohio Wesleyan University in 1888 and ordained in the Methodist ministry in that year. He was president of the South American School of Theology, Mercedes, Argentina, in 1894–7, professor of biology and geology at Kansas Wesleyan University in 1899–1901, and since 1902 has been professor of science at Marion High School, Ohio. He withdrew from the Methodist ministry in 1902. He has translated several theological works from the Spanish.

Tube-weaver, a group of spiders (q.v.).

Tube Well, or Driven Well, a device for obtaining water from the soil, consisting of an iron pipe of small diameter, pointed at the lower end, and driven vertically down into the earth by means of a small pile-driver until it pierces a water-bearing stratum. The tube is provided with a number of lateral perforations near its lower end, through which the water can enter it. In some cases the water exists in the soil under a pressure sufficient to cause it to flow up through the tube and out at the top; but more commonly a pump must be applied at the upper end, to draw the water up to the surface. When the well is to be driven to a depth greater than about 14 feet, the tubing is usually constructed in sections, which are united by means of screw connections; new sections being added at the upper end as the sinking of the well proceeds.

Tuber, a shortened, thickened, fleshy, subterranean stem in which the leaves appear as scales with axillary dormant buds, collectively

called "eyes" in the potato, and Jerusalem artichoke, which are good examples. Internally they contain starch as a principal component. Their office is to act as reservoirs of food and to propagate the species when favorable conditions present. Plants which bear tubers are all perennials.

Tubera'ceæ. See FUNGI.

Tuber'culin, a substance used to test for the presence of the disease tuberculosis in cattle. Prepared as follows: The tubercle bacilli or germs are allowed to grow in broth containing glycerine. After growing for several weeks, the bacilli produce certain toxic or poisonous substances which are soluble in and hence dissolved in the broth.

The toxic solution is then filtered from the bacilli and is the solution tuberculin. When injected in small quantity into a healthy animal it produces no effect, but if the animal has the disease tuberculosis it causes a decided rise in bodily temperature and hence can be used as a test for that disease.

Tuberculosis, an infectious, communicable disease caused by the bacillus of tuberculosis. The bacillus induces the formation of little nodules called tubercles. These tubercles may grow in size through the continued action of the organisms; they may soften, break down, and be expelled, leaving behind an ulcer or a cavity; they may become hard by a process of sclerosis; or they may calcify. In addition to the local manifestations the disease produces general symptoms like elevation of the body temperature, increased pulse-rate, and loss of weight.

Distribution of the Disease, Geographical.— Tuberculosis is the most universal of all diseases. It is found in every part of the world, and has been known from the beginning of history. It was accurately described by Hippocrates (460 B.C.), and by Galen (200 A.D.). It is most prevalent, however, in large cities or great centres of population, and especially in over-crowded districts. It is least prevalent in mountainous regions.

Distribution According to Race.— No race is exempt, but some races appear less resistant than others. Indians, when brought into civilization, prove especially susceptible. Among the other races in this country the negroes are the most susceptible, and next in order are the Irish, while Jews stand at the end of the list. In the general mortality about one seventh of all deaths are due to it.

Distribution Among Animals.—Most animals are more or less susceptible. Among domestic animals it is found most frequently in cattle and swine, though sheep and horses are not exempt. Dogs and cats manifest it rarely. It is also found in birds (fowl) and fish. Wild animals in their native haunts seem less susceptible, yet in domestication it is the most common cause of death. Rabbits, guinea-pigs, rats, and mice may acquire it. Guinea-pigs are especially susceptible to experimental inoculation, and are therefore commonly used for this purpose.

Etiology (Causation).—The actual cause of the disease is the tubercle-bacillus described by Robert Koch in 1882. This is a minute vegetable non-motile organism in the shape of a rod or lead-pencil, measuring about 3 microns ($\frac{3}{2500}$ of an inch) in length, and about 4 to 6 times longer than broad. It is visible only under the higher powers of the microscope, a 1-12 oil-immersion lens being usually used to study it. Its principal characteristic is its behavior toward aniline dyes. It requires the strongest dyes to stain it, but when stained it holds the dye so tenaciously that exposure even to strong mineral acids for a reasonable time fails to decolorize it. This characteristic furnishes the most ready means for its recognition. The common process of staining it is as follows: Some of the material (sputum, pus, the dregs of urine, etc.) is spread on a glass slide and allowed to dry. The specimen is fixed to the slide so that it will not readily wash off by slight heating (passing three times through the flame of a Bunsen burner). It is then stained for 5 minutes with carbol-fuchsin, called Ziehl's solution (fuchsin 1 part, alcohol 10 parts, 5 per cent carbolic acid, with a little glycerine, 90 parts). The stain is washed off with running water, and the specimen decolorized and counterstained for about 1 minute with Gabbet's solution (methylene-blue 1 part, nitric acid 25 parts, water 75 parts). Gabbet's solution is washed off in running water, and the specimen is dried with blotting-paper. It is now ready for study. The tubercle-bacilli appear red, everything else blue. It is quite parasitic in nature, growing on but few artificial media; namely, blood-serum, glycerine-agar, bouillon, or potato, best on the first. It grows only at the body temperature (37° C.). It is slow in growth, and becomes apparent only from 7 to 14 days after inoculation of the medium. Growing in large masses artificially, it appears as dry grayish white or grayish brown thin scales. Exposure moist to a temperature of 60° C. for 15 minutes, or boiling, kills it, though freezing has no effect on it. It is killed by direct sunlight within a variable period of time (from 15 minutes on), depending on the season and the character of the medium containing the organism; by diffuse sunlight near a window in a week. In growing (either parasitically or without the body) the organism elaborates a chemical product highly poisonous to most animals. It is this poison circulating in the blood that produces the general symptoms of the disease, such as fever, increased heart-beat, emaciation, etc. Tubercle-bacilli found in different animals differ in their characteristics. The human, bovine, avian, and fish varieties have been differentiated.

Predisposing Causes.— Though the bacillus of tuberculosis is the actual cause of the disease whenever it occurs, other factors require consideration. As wheat will not grow on every soil, so the tubercle-bacillus will not grow in every individual. In fact it would appear that the majority of human beings are quite insusceptible, and that as a rule an overwhelming dose of the organisms repeated frequently for some time is necessary to overcome the resistance. All the conditions necessary to produce susceptibility are unknown, yet it is empirically true (and could be with reason supposed) that any circumstance which tends to lower the general vital resistance decreases the resistance to tuberculosis. Therefore defective and insufficient food, overwork, chronic alcoholism, surroundings like a damp, dark, overcrowded dwelling, persistent irritation of a somewhat naturally susceptible part of the body, as irritation of the lungs by the

constant inhalation of dust (mine-workers, stone-cutters, etc.), previous severe disease like typhoid fever, etc., all tend to increase the susceptibility. It was thought in the past that the most common cause active in the production of susceptibility was heredity. The argument was the same that prevailed in regard to the heredity of the disease itself, before its communicability was recognized; namely, that tuberculosis is most commonly seen in descendants of tubercular subjects. This is true, yet it is doubtful if those descendants are more susceptible than other people. In fact a strong argument can be deduced to the contrary; namely, that the descendants of the tuberculous are less predisposed than other people. Granting the communicability of the disease (and this is undoubted), it is evident that no one is more exposed to it than the children of tubercular parents. If therefore they were very susceptible no child whose mother was afflicted with tuberculosis of the lungs ought to reach adult age. The fact is, however, that children of tubercular parents scarcely ever die of the disease under 15. In other words, though they live in an atmosphere impregnated with the germs, and although they not infrequently, at different times in their lives, manifest symptoms showing more or less slight implantation, they resist for 15 years or longer. What now is the case with persons with no tubercular heredity when exposed thus closely to the disease? This is comparatively easily learned from cases where a man or woman with no tubercular heredity marries a tubercular person. Although by no means the invariable rule, such marriages seem to furnish a disproportionately large number of cases of galloping or rapid consumption. It is not uncommon to see a man or woman of tubercular ancestry with a chronic tuberculosis of the lungs bury two or even three consorts with tuberculosis, while he or she lives on sometimes to a ripe old age.

Flick's paper on tuberculosis as a house-disease goes to prove its communicability. He investigated all the houses of the largest, oldest, and most thickly populated ward in Philadelphia, and found that the deaths from tuberculosis in that ward were disproportionately large in certain houses. In short, he demonstrated case after case of apparently healthy families moving into a house previously occupied by a tubercular person with the result that one or more members died of the disease. Despite this, however, it is still generally held that, although the disease itself is not hereditary, there is a vulnerability transmitted.

Modes of Infection.—There are four possible modes of infection; namely, inoculation, heredity, inhalation, and ingestion.

Inoculation.—Villemin's work, supplemented by that of Cohnheim and Salamonson, absolutely established the fact that the disease was inoculable. Inoculation is, however, quite rare as a method of general infection in human beings, and its occurrence is practically limited to special occupations. Inoculation with the production of a strictly limited local lesion is reasonably common on the hands of physicians who do anatomical or post-mortem work (the post-mortem wart, the *leichen*-tubercle of the Germans), of butchers, tanners, etc. Local tubercles have also been produced by piercing the ears for earrings, by tattooing, and by washing the clothes of a tuberculous patient. Both local and generalized tuberculosis have been reported as a result of the rite of circumcision, the last step in which is the sucking of the wound. Vaccination has been specified as the cause of the disease in several instances, but not since the present aseptic methods for removal of the vaccine matter came into vogue.

Heredity.—Up to the time of Villemin this was the generally accepted mode of acquiring the disease, though here and there down the centuries from the time of Galen some one has stood out against it in favor of the theory of contagion. Hereditary transmission has been experimentally proven on the lower animals (Gärtner), and occasionally demonstrated in human beings by the finding of tubercular lesions in the fœtus. These proofs occur so rarely, however, that the ordinary view, that practically all cases are examples of contagion, is fully warranted.

Inhalation.— The common belief at the present day is that the majority of cases of tuberculosis are the result of inhalation of the germs. The contagiousness of the disease being proven, and the infectious bacilli being found in the matter given off from a tuberculous ulcer (therefore in the sputum in tuberculosis of the lungs), it is readily understood how people living with a consumptive may be more or less constantly inhaling the contagion. Nuttall's estimate of the number of bacilli thrown off in the expectoration daily could only make one wonder how anybody escapes the disease, were it not that they are so easily and quickly devitalized. In a case where the patient expectorated about 4 ounces daily, Nuttall estimated the number of bacilli to be from one and a half to four billions in the 24 hours. Experiments on animals with the dust of rooms occupied by tubercular patients have usually proven positive (Cornet). The arguments for the theory of inhalation as the most common mode of infection are: (1) the very great frequency of tuberculosis of the lungs even as a primary infection; (2) the frequency with which all persons are exposed to this form of contagion.

Ingestion.—For years it was thought that primary tuberculosis of the lungs was the result of inhalation of the germs, and primary intestinal tuberculosis the result of ingestion with food or otherwise. The argument favoring this view appeared plain; namely, that primary intestinal and peritoneal tuberculosis is almost limited to children, especially the bottle-fed. Living as they do entirely on cows' milk, and considering the susceptibility of horned cattle to tuberculosis, the inference seemed so justified that scarcely any exception was taken to it. In addition, adults who live as a rule on cooked food scarcely ever show intestinal tuberculosis as a primary infection, but practically always tuberculosis of the lungs, which would readily seem to be the result of contact with the disease in their occupation, sleeping-rooms, etc. This plain view of the matter has, however, undergone a change. The majority of clinicians and pathologists of our day believe that children manifest the intestinal form more frequently simply because the intestine is more susceptible at that age, and adults the pulmonary form for an analogous reason. For several years at the end of the 19th century considerable was written to prove that practically all cases of tuberculosis

were the result of ingestion of the germs. It was contended that even in primary tuberculosis of the lungs the germs entered through the digestive tract, passed into the chyle-vessels with the fat, were carried through the thoracic duct to the heart, and took up lodging in the lung on account of its non-resistive power. The experiments about this time demonstrating the infectivity of cows' milk became so numerous (Gerlach, Bang, Bollinger, Ernst) that the question of the digestive tract as a probably common route (if not actually the most common) seemed practically settled. At the British congress on tuberculosis in 1901, however, Koch threw a shell which scattered scientific physicians and left them in two hostile camps. Coming from any one else the opinion (for it was scarcely more than an opinion, being based on a small number of experiments) would have been scoffed at, but coming with Koch's authority it could not fail to arouse interest and even advocates. Koch affirmed that the difference between the bovine tubercle-bacillus (that is, the bacillus causing disease in cattle) and the human tubercle-bacillus was such that one was not contagious to the other species, or was so slightly contagious that the number of cases of tuberculosis thus produced might be left out of consideration without impairing statistics. This was at once denied at the congress by Ravenel, who has since devoted himself to disproving it. The question of the contagiousness of the bovine bacillus for man is practically still under consideration, and with it remains the question whether inhalation or ingestion is the most common route of infection.

Pathology.—The tubercle is the specific lesion of the disease, no matter in what organ it occurs. It was first described by Baillie in 1794. In its typical form the tubercle consists of a larger or smaller amount of necrotic (caseous) material, surrounded by epithelioid and lymphoid cells, and, usually imbedded in the caseous material, one or more giant cells. The tubercle-bacilli are found within the giant cell and at the edge of the caseous material between the epithelioid cells.

The epithelioid cells are supposed to be new-formed young connective-tissue cells, the result of proliferation of the fixed cells of the part. They are called epithelioid on account of their resemblance to epithelial cells, though they may originate from either connective tissue or epithelium. They are about two to four times the size of the lymphoid cells, and consist of a small vesicular nucleus surrounded by a relatively large amount of protoplasm. The lymphoid cells are supposed to be small lymphocytes from the circulation. They resemble exactly the small lymphocytes, consisting of a large deeply staining nucleus surrounded by a small amount of protoplasm.

The giant cell is a very large cell, three to eight or more times larger than an epithelioid cell, and contains a number of vesicular nuclei resembling those of the epithelioid cells. These nuclei are as a rule arranged in the form of a wreath about the periphery, or in two groups at the ends of an elongated cell. This arrangement of the nuclei is quite characteristic of tuberculosis, because in syphilis or tumors (like sarcomata) when giant cells appear, the nuclei are as a rule arranged centrally. The central mass of the cell usually shows necrotic (caseous) change.

About the origin of the giant cells there is a difference of opinion. Baumgarten and the majority of investigators believe that they arise from the same cells as the epithelioid, namely the fixed cells. The French school, following the lead of Metchinikoff, affirm that they are macrophages resulting from the fusion of phagocytes. The former make them weaker cells; the latter stronger. The former contend that the protoplasm fails to divide so as to make two or more cells because it is diseased. As a proof of this they point to the caseous change usually evident in its centre.

The question of the cure of the tubercle seems to depend on whether the epithelioid cells or the tubercle-bacilli obtain the upper hand. If the epithelioid cells are manufactured more rapidly than the tubercle-bacilli destroy them they form a dense wall about the tubercle-bacilli, elongate, become fully formed fibrous connective-tissue cells, thus shutting the bacilli up in a capsule, and the bacilli die, while the caseous material calcifies or is absorbed and replaced by scar-tissue (sclerosis of the tubercle), or in connection with the scar-tissue undergoes a hyaline change (fibroid tubercle). If, however, the bacilli are victorious the tubercle may grow larger and, coming in contact with other tubercles, form what is known as a conglomerate tubercle, and so continue until even a whole organ is involved. Again, the caseation may advance so rapidly, especially in the lung, that there is never any sharp demarcation between healthy and diseased tissue. This is generally called diffuse tuberculosis, and in the lungs is known as caseous or tubercular pneumonia.

Finally, as the tubercle advances, other micro-organisms (particularly streptococci or staphylococci) may gain entrance to the caseous material and break it up. If now the tubercle, in growing, reaches a surface its liquid contents may be expelled, leaving behind an ulcer or a cavity. This happens most frequently in the lungs, and the resultant cavity may be of any size from a pea to that of a whole lobe of the lung.

When the tubercles are small in size, varying only from a millet-seed to a pea, they appear to the naked eye as grayish white or yellowish white specks; hence the name of miliary tuberculosis, of which any organ or tissue of the body may be the seat

Differences in Pathology Manifested by Various Organs: Lungs.—The earliest lesions are as a rule found in the apices of the different lobes, especially the upper. The reasons for this probably are: (1) the apices, being farthest removed from the branches of the artery, suffer in nutrition; (2) being farthest removed from the point where air enters, they are less used and become less resistant. Besides a miliary tuberculosis the lungs show a diffuse process called tubercular pneumonia. This differs from the miliary tubercle in size and in not being sharply separated from healthy tissue by layers of epithelioid and lymphoid cells. The process is too rapid to permit the formation of these cells, and the mass consists entirely of caseous material. It is called clinically phthisis florida or galloping consumption.

Cavities in the Lungs.—These cavities are usually seen at the apices. They may be one or

many, microscopic or as large as a lobe. The cavity may be within the lung, and limited by the pleura (in which case the pleura thickens about it), or it may break through into the pleural cavity, causing tubercular empyæma, or pyo-pneumothorax (pus and air in the pleural cavity). The character of the wall surrounding such cavities differs. Cavities forming rapidly may have no wall, but be surrounded by lung-tissue. More commonly, however, they are of slow formation, and then possess a fibrous capsule which shows three zones; namely, exteriorly fibrous tissue; next to it granulation-tissue; and interiorly a tubercular mass undergoing disintegration. The cavity may grow larger by the tubercular process invading the granulation-tissue, the fibrous capsule continuing to develop further away.

Sometimes the tubercular process is associated with the new formation of fibrous tissue, not alone in the tubercles but throughout the lung. This is called cirrhosis, sclerosis, or fibrosis of the lung.

Lymph-Glands.—The lymph-glands usually show a diffuse tuberculosis. Children are most frequently the victims, and the bronchial, cervical, and mesenteric are the glands of predilection.

Bone.—Both the miliary and the diffuse process are found in the bone. It is likewise most common in children. It may be limited to the medulla or periosteum, and spread from either to the cortical portion, producing necrosis (tubercular caries). It is most frequent at the joints, especially the hip and the intervertebral.

Intestines.—The intestines show either a miliary variety (the tubercle lying either beneath a mucous membrane or the peritoneum) or a chronic ulceration. Both forms are usually secondary to tuberculosis elsewhere, though the latter is seen as a primary infection, especially in children. The ulcers are almost always confined to the lower part of the small intestine, and usually originate in the patches of lymphoid tissue. Miliary tuberculosis (tubercular ulcers of the appendix) is not uncommon, particularly in advanced tuberculosis of the lungs.

The organs most commonly affected in adults are the lungs; in children, the lymph-glands, bones and joints. The other organs are affected much less frequently, and in about the following order: intestines, peritoneum, kidneys, brain, spleen, liver, generative organs, pericardium, heart. Tuberculosis of the skin comes under the head of lupus (q.v.).

Symptoms, Prognosis, and Treatment.—The symptoms vary naturally with the part of the body affected, but the organs may be considered so as to bring them under certain sets of symptoms. An acute and chronic tuberculosis may be first distinguished. Of the acute there are two varieties, acute miliary tuberculosis, which is usually general, and acute tubercular pneumonia.

Acute Miliary or General Tuberculosis is characterized by the formation of tubercles in various parts of the body. It may begin as a primary infection or be secondary to an acute or chronic affection in a particular organ. It is most common as a termination of a chronic affection of the lungs. All the organs may suffer, though it is usually limited to one, two, or three. It comes on rather rapidly, like the ordinary acute infectious diseases, and is sometimes distinguished from them (especially typhoid fever) with difficulty. There is a loss of appetite, loss of flesh and strength, fever (102° to 104° F.), weakened pulse, hurried respirations (corresponding to the fever unless the lungs are involved, when they are more rapid), a brown fissured tongue, delirium, then stupor and death. The duration is from two to four weeks. When the lungs are affected there are in addition cough and expectoration, which may or may not contain tubercle-bacilli. When the intestines are affected there is pain, tenderness over the abdomen, and diarrhœa. When the meninges are affected there are headache, convulsions, delirium, stupor, and coma.

The diagnosis can only be made with certainty when there is knowledge of a previously existing tuberculosis or of an exposure to contagion, or by the finding of tubercle-bacilli in the excretions. The prognosis is always fatal. There is therefore no treatment except to endeavor to control symptoms.

Acute Tubercular Pneumonia.—This is practically always secondary to a chronic tuberculosis of the lungs. It begins, like lobar (ordinary) pneumonia, with a chill, high fever, rapid pulse, shortness of breath, hemorrhagic sputum, flushed face, and the physical signs of consolidation of parts of the lung. Instead of ending by crisis about the ninth day, like lobar pneumonia, it continues to a fatal termination; or the acute symptoms gradually subside, the diseased area becomes fibrous, and the patient gradually gets well, or approximately so, with a loss of lung-tissue equal to the involvement, which is sometimes an entire lung. The diagnosis is made by the ordinary signs of pneumonia and the tubercle-bacilli in the sputum. The prognosis is very unfavorable; rarely, however, a case recovers sufficiently to lead a useful life for a number of years. The treatment is that of lobar pneumonia; namely, rest in bed, stimulation, and the keeping in check of the worst symptoms. When the patient gets well enough to rise from bed, the case becomes chronic, and the treatment is the same as in chronic pulmonary tuberculosis, considered below.

Chronic tuberculosis is met with in two forms, tuberculosis of the lymph-glands and chronic tuberculosis of the lungs.

Tuberculosis of the Lymph Glands.—This, commonly called scrofula, is usually seen in children and is not infrequently limited to the glands of the neck. The infection is commonly primary, though it is not always possible to discover the point of entry into the body. The patients are frequently children of tuberculous parents, so that the question of exposure to contagion is usually clear. It is confidently affirmed by some writers that many of those cases are examples of intra-uterine infection, the bacilli lying dormant or practically dormant for years. See SCROFULA.

Chronic Tuberculosis of the Lungs.—This is what is ordinarily understood by consumption, or tuberculosis of the lungs without qualification. Its symptoms vary with the progress of the disease, and the susceptibility of the individual to the poison (toxin) excreted by the bacillus. The onset is usually insidious, and the disease not infrequently continues for years before the patient recognizes it. The symptoms are very often brought out by a "cold" from

which the patient seemingly does not recover. Many therefore attribute their disease to such a "cold." The first noticeable symptom is sometimes a hemorrhage or a pleurisy; again, a progressive loss in weight or a slight dry cough, becoming gradually worse. The most important very early symptoms are usually slight fever, especially toward evening (which may or may not be accompanied by a chill), hectic flush, acceleration of the pulse-rate, cough, expectoration, loss in weight, progressive pallor of the skin, night-sweats, indigestion or loss of appetite, vague general pains, and soreness localized in the chest. In addition to these the physician on close examination elicits others. These are brought out by auscultation and percussion (qq.v.), and point to a solidification limited to one or more areas of the lungs, most commonly either apex. The one positive sign of tuberculosis at this stage is the finding of tubercle-bacilli in the sputum. If every lesion were open, that is, in communication with a bronchus, there would be tubercle-bacilli in the sputum from the earliest stages, and the diagnosis would be easy; but many lesions are closed, that is, completely encapsulated, and therefore show no bacilli in the sputum. Hence the physician must rely on other symptoms.

As the disease advances, all the foregoing symptoms are intensified. The pulse-rate becomes more rapid, so that it is evident to the patient in palpitation or shortness of breath, the temperature rises to 102 or more, the loss of weight becomes excessive, frequently reaching ¼, sometimes ⅓, and rarely ½ of the usual weight, the pallor becomes marked, the appetite is completely lost, cough may become almost continuous day and night and of a most racking character, expectoration increases, the feet usually swell and the picture presented is known to everybody. The patient is extremely emaciated, the chest, usually rounded, is quite flat, the depressions above and below the clavicles are marked, and the scapulæ stand out prominently on the back. Hemorrhage may or may not occur. As a rule there is little or no pain. The lungs themselves possess no sensitive nerves, and it is only the associated pleurisy which occurs at intervals that produces this symptom. Examination by the physician now reveals the signs of extensive solidification. This may extend over one whole lung or over the greater part of both. It may or may not be associated with cavities.

Chronic tuberculosis of the lungs, when diagnosed sufficiently early, and when the personal resistance is good, is a very curable affection. This is proven by the number of cured lesions found at autopsy. It is very conservative to say that 35 per cent of all bodies coming to the autopsy table past the age of 50 (death having been the result of some other disease than tuberculosis of the lungs), show a healed lesion of tuberculosis of the lungs. The present post-mortem and clinical records demonstrate that 75 per cent of cases recover. Moreover, these post-mortem records are absolute; there is no practical question of diagnostic error. In addition, many cases with a lessened resistance can be so improved under judicious treatment that their lives are prolonged in comfort for 10, 20, even 30 years. Such an example is E. L. Trudeau, director and founder of the Adirondack Cottage Sanatorium.

Prevention in Cases of Chronic Tuberculosis of the Lungs.—The contagion is contained in the matter given off from a tubercular sore. Therefore, in a case of tuberculosis of the lungs it is only necessary to destroy the sputum to prevent contagion to others. The patient should expectorate only into receptacles where the sputum can be properly handled without coming in contact with other things. He should never expectorate into rags or handkerchiefs, but should limit himself to a spit-cup and paper napkins. The spit-cup should be made with a handle, and should contain an antiseptic or germicide. Ordinary lye will suffice. The cup should be boiled daily. When coughing, the patient should hold a paper napkin before his mouth. His eating-utensils should be separate, and should be thoroughly boiled after using. There should be no question of anyone sleeping with the patient. Children are especially susceptible; hence, when the parents are tubercular, extra care must be exercised.

Persons exposed to tuberculosis at home should live out of doors as much as possible, and take care that their nutrition is kept up to the standard. Any occupation necessitating close confinement, especially in a vitiated atmosphere with many other persons, predisposes the individual to the disease. Thus the two occupations showing about the highest morbidity are printing and cigar-making.

Treatment of Chronic Tuberculosis of the Lungs.—There is no known specific for the disease. Koch's tuberculin is used by comparatively few physicians and by them only in selected cases. In the hands of the great majority of physicians the treatment is entirely hygienic. The disease progresses on account of a lack of resistance in the patient; the object therefore is to increase the resisting power. This is accomplished by rest, a regular life, fresh air, and good nourishment. The patient is advised about as follows: To lead a regular life, retiring at a proper hour (before 10 P.M. if an adult), in order to get sufficient rest. He should have nine hours' sleep, must sleep alone and, when possible, in a room alone. The best situation for the room is on the southwest corner of the house. The windows of the sleeping-room should be kept wide open, no matter what the weather. (In summer all the windows in the room, and in winter, when the air diffuses much more readily, one window at least, should be wide open. The idea is to make every inhalation one of fresh air.) During the day the patient must spend as much time as possible out of doors. When the weather is cold he should be comfortably wrapped. It is better to multiply the coverings that are readily removed than underclothes. Patients suspecting lung trouble frequently come to the physician wearing a chest-protector, two or even three undershirts, and other clothes. This is not only unnecessary, but probably harmful. The regulation clothes of the kind most comfortable to the patient are all that are required.

Diet.—Some physicians of repute in tuberculosis advise a general mixed diet under the admonition to eat as much as possible of everything. The diet found most generally suitable to the great majority of patients at the Free Sanatorium for Poor Consumptives at White Haven, Pa., is as follows: Breakfast, 8 A.M. One to two pints of milk, with two or three raw

eggs (the eggs may be broken up in the milk or taken whole), with fruit and a cereal. Lunch, 10 A.M. One pint of milk, and one or two raw eggs. Dinner, 12:30 P.M. Soup, meat, three or four kinds of vegetables and fruit, with milk as the beverage. Lunch, 3:30 P.M. One pint of milk, and one or two raw eggs. Supper, 6 P.M. One to two pints of milk, two or three raw eggs, and boiled rice. Lunch, 9 P.M. (just before retiring). One half to one pint of milk, with or without a raw egg. Some patients take more nourishment than this; few, if any, who do well take less. Alcohol (whiskey, brandy, etc.), which was at one time much lauded, especially by the laity, is now avoided by the majority of experts.

Climate.— Up to a very recent time considerable dependence was placed on climate. Patients who could afford it were at once advised to betake themselves to the Southwest, and not infrequently those who could not afford it were told to "beat their way." It is still generally believed that a high dry climate is more suitable for the cure of the majority of patients; yet no matter what the climate, the patient must carry out the foregoing or a similar line of treatment. It is to be remembered that tuberculosis is a disease of all climes and altitudes; that cases develop in Colorado and New Mexico as well as in Canada, and that cases have been and are being cured in all parts of the world. Some writers, among them many eminent in the specialty of tuberculosis, absolutely deny any influence to climate. This, however, may be affirmed with certainty: that if the removal to another climate entails or is likely to entail, the least hardship or privation, it is better for the patient to remain at home.

Sanatoriums.— New sanatoriums for the treatment of tuberculosis are springing up almost every month. They are opening their doors as a result of private enterprise or benefaction or of a municipal crusade against the disease. They serve a three-fold purpose: (1) they gather in consumptives from large centres of population, and so prevent them from acting as a focus of contagion; (2) they instruct the patient how to take care of himself so that he is not a menace to others even when he returns home; (3) they demand a discipline which, if followed out, will in a favorable case cure. As a rule cases do better in sanatoriums than at home.

Bibliography.— For scientific treatment of the subject, the following writings may be consulted: Laennec, 'Diseases of the Chest' (1823); Villemin, 'De la propagation de la Phthisis' (in 'Gazette hebdomadaire' 1869, p. 260); Gerlach, 'Ueber die Impfbarkeit der Tuberkulose und der Perlsucht bei Thieren, sowie über die Uebertragbarkeit der letzteren durch Fütterung' (in Virchow's Archiv., Bd. LI., 1870); Colnheim and Salamonson, 'Sitzungsbericht der schlesischen Gesellschaft für Vaterländische Cultur' (13 July 1877); Koch, 'Die Ätiologie der Tuberkulose' (in 'Berliner Klinische Wochenschrift,' No. 15, 1882); and 'Weitere Mittheilungen über der Tuberkulose' (in 'Deutsche Medizinische Wochenschrift,' 1891); and 'Ueber bakteriologische Forschung' ('Verhandlungen des X. Internationalen Medizinischen Congress,' Berlin, 4 Aug. 1890); and 'Die Ätiologie der Tuberkulose' (in 'Mittheilungen aus dem K. Gesundheitsamte,' Bd. I.); Verneuil, 'Etudes experimentales et cliniques sur la Tuberculose' (1887); Cornet, 'Verbreitung der Tuberkelbacillen ausserhalb des Körpers' (in 'Zeitschrift für Hygiene,' 1888, Vol. V.); Flick, 'A Review of the Cases of Tuberculosis which Terminated in Death in the Fifth Ward of Philadelphia, during the Year 1888' (in 'Proceedings' of the County Medical Association, May 1889); and 'The Prevention of Tuberculosis. A century's experience in Italy under the influence of the prevention laws of the kingdom of Naples enacted in 1782'; (in 'The Sanatarian,' February 1891); and 'Immunity as against Heredity in Tuberculosis' (in 'Journal of Tuberculosis,' October 1899); and 'Crusade against Tuberculosis. Consumption a Curable and Preventable Disease. What a Layman should Know about' (1903); Senn, 'Tuberculosis of Bones and Joints' (1892); Sairtzky, 'Wie lange behält trockenes Sputum der Phthisiker unter den gewöhnlichen ländlichen häuslichen Bedingungen seine infectiöse Eigenschaft?' (in 'Centralblatt für Bakteriologie' 1892, Bd. XI.); Reibmayer, 'Die Ehe Tuberkulosen und ihre Folgen' (1894); Strauss, 'La Tuberculose et son Bacille' (1895); Ravenel, 'A Case of Tuberculosis of the Skin following Accidental Inoculation with the Bovine Tubercle Bacillus' (in 'Proceedings' of the Pathological Society of Philadelphia, January 1902); Ott, 'Die chemische Pathologie der Tuberkulose' (1903); Bang, 'Ueber die Euter Tuberkulose der Milchkühe' (in 'Zeitschrift für Thiere,' Bd. XI.). More popular treatments will be found in the following works: Tyndall, 'On the Origin, Propagation and Prevention of Phthisis' (in 'The Fortnightly Review,' 1 Sept. 1891); Walters, 'Sanatoria for Consumptives in Various Parts of the World' (1899); Knopf, 'Pulmonary Tuberculosis: Its Modern Prophylaxis and the Treatment in Special Institutions and at Home' (1899); Thorne, 'The Administrative Control of Tuberculosis' (1899); Wise, 'How to Avoid Tubercle' (1900); Squire, 'Essays on Consumption' (1900); Vinrace, 'War Against Consumption' (1901); Ruata, 'Pulmonary Tuberculosis: Its Prevention and Cure'; Gibson, 'The Nordrach Treatment' (1902); Bridge, 'Tuberculosis' (1903); Latham and West, the prize essay on the erection of the "King Edward VII. Sanatorium" for consumptives (1903); Latham, 'The Diagnosis and Modern Treatment of Pulmonary Consumption' (1903); Osler, 'The Home in Its Relation to the Tuberculosis Problem' (in 'The Medical News,' New York, 12 Dec. 1903); Woodhead, 'The Morbid Anatomy and Histology of Pulmonary Tuberculosis.' Lecture under the auspices of the Henry Phipps Institute, Philadelphia; published in pamphlet form by the Institute.

JOSEPH WALSH, A.M., M.D.,
Physician to the Henry Phipps Institute and to the White Haven Free Sanatorium for Poor Consumptives.

Tuberculosis, in cattle. See RINDERPEST.

Tuberose, tū'bē-rōs or tūb'rōz, an amaryllidaceous garden-flower (*Polianthes tuberosa*). The funnel-shaped perianth, an incurved tube, with somewhat rose-like lobes, often doubled in cultivation, has caused a misunderstanding as to the name, which properly refers to tuberous roots, but is generally pronounced as if it were "tube-rose." The flowers are creamy-white,

waxen and brittle in texture, do not fade quickly, and are extremely fragrant, especially toward night. They are borne in a raceme at the top of a slender stem, from 2 to 3 feet tall. This stalk springs from a tuft of linear leaves, and is sheathed with the bases of others. The tuberose is raised from bulbs, which are not hardy in the northern, but are grown for the trade very successfully in the southern, United States.

Tubes, Pneumatic. See PNEUMATIC TUBES.

Tubes of Force, imaginary tubular spaces in a field of force, and especially in a field of electric or magnetic force, whose bounding surfaces may be regarded as made up of lines of force. At any point in the surface of such a tube, the resultant force has a direction that is tangent to the tube. The conception is due to Faraday, and is very useful in forming a mental image of the physical state of a field of force. A tube of force cannot have a free end in any finite region of space. The tube must either return into itself, or pass off to an infinite distance, or terminate upon a mass of matter. The total number of lines of force included within a given tube of force is constant throughout the entire length of the tube; and hence it follows that the total force at all sections of the tube is the same; the intensity of the force varying inversely as the cross-section of the tube. In the case of an isolated electrified sphere, the tubes of electric force are radial cones, which converge, in external space, towards the centre of the sphere, but which terminate upon its surface. (Also called "Tubes of Induction." See ELECTRICITY; MAGNETISM; INDUCTION.)

Tubigon, too-bē'gŏn, Philippines, pueblo, province of Bohol; on the west coast; 24 miles northeast of Tagbilaran. It is on the coast highway. Pop. 15,860.

Tübingen, tü'bĭng-ĕn, Germany, a town in Würtemberg, on the Neckar, 16 miles southwest of Stuttgart. The town stands in the midst of diversified scenery and is the seat of a national university. New buildings have been erected in connection with this flourishing institution, comprising various medical and physiological institutes. The university was founded in 1477. The library contains 250,000 volumes. There are a botanical garden and fine scientific museums and collections, and an observatory. Names of celebrities connected with the university are Melanchthon, Reuchlin, and Baur. There is trade in agricultural produce, wine and fruits. Its chief history is connected with the 30 Years' War and the Reformation. Pop. (1900) 15,323.

Tübingen School, a name given to two separate and very different schools of philosophy, because their founders were connected with the famous University of Tübingen. The old school of Tübingen was orthodox. Gottlob Christian Storr, its founder (1746–1805), professor of philosophy at Tübingen in 1775, and professor of theology two years later, accepted without reserve the divine authority of the Scriptures, and defended miracles. Storr severely criticised Kant's book: 'Religion Within the Limits of Pure Reason,' and he set forth his own system in a work called: 'Theory of Christian Doctrine Drawn from the Scriptures.' The later or modern school is that of Ferdinand Christian Baur (1792–1860) also professor of theology at Tübingen. Besides attacking the authenticity of certain of the Pauline epistles, he attempted to show that the fourth Gospel was not genuine. He admitted the morality of Christianity, but denied the miracles attributed to Christ and his apostles. Although Baur moderated his tone in later years his teachings promoted the spread of unbelief, and the 'Life of Jesus' by Strauss (1832), which attempted to show the Gospel to be a philosophic myth, was the outcome in a large degree of the critical studies of Baur.

Tubuai, too-boo-ī', or **Austral Islands,** Polynesia, a group of islands belonging to France, and situated in the Pacific Ocean south of the Society Islands. Combined area, 111 square miles. They are fertile, and produce tobacco, bananas and arrow-root. The cocoa-palm is rare, and the bread-fruit is not found here. Pop. (1897) 1,783.

Tubular Bridge. See BRIDGE.

Tuburan, too-boo'răn, Philippines, pueblo, province of Cebu; on the west coast, on Tañon Strait, 30 miles northwest of Cebu. It is on the west coast highway, and is a place of considerable importance. Pop. 12,570.

Tuck'ahoe, an Indian generic name, applied by the eastern Algonquins, to all roundish roots. Specifically, it was the name of several Indian foods, as of the golden-club (*Orontium aquaticum*), and the arrow-arum (*Peltandra undulata*), both having deep and fleshy root-stocks, acrid when fresh, but rendered edible by cooking, and abounding in starch. Another tuckahoe was a subterranean fungus (*Dachyma cocos*), found very generally throughout the Southern States in light, loamy soils, and growing on old roots, either as a saprophyte or a parasite. In form, size and cortex, it is not unlike a cocoanut, and is white and apparently structureless within, moist and yielding when first dug up, but becomes dry and cracked internally soon afterward. It is also called Indian-bread, Indian-head, or Indian-loaf, but is without starch, composed largely of pectose, and is tasteless and insoluble in water.

Tucker, tŭk'ĕr, **Abraham,** English philosopher: b. London 2 Sept. 1705; d. Beckworth, Surrey, 20 Nov. 1774. He studied at Oxford, and later at the Inner Temple in preparation for the bar; but upon the death of his father he retired to his estate near Dorking. In 1754 he began to write his philosophical works, and nine years later published his first treatise, 'Free Will.' The first four of the seven volumes of his most celebrated work, 'The Light of Nature Pursued,' was published in 1768, and the last three posthumously.

Tucker, Charlotte Maria ("A. L. O. E.," that is, A Lady of England), English juvenile writer: b. Barnet, Hertfordshire, 8 May 1821; d. Amritsar, India, 2 Dec. 1893. She began her literary career in 1852 with the publication of 'Claremont Tales' and subsequently published more than 50 books besides numerous short stories. In 1875 she went to India where she engaged in missionary work until her death. Her books are chiefly of an allegorical character and are strongly religious in tone. The proceeds from their sale she devoted principally to her missionary work. Among them are: 'Wings and Stings' (1853); 'Old Friends with New Faces' (1858); 'The Lost Jewel' (1868); 'Fairy Frisket' (1874); 'Pride and His Pris-

oners' (1882); 'Driven Into Exile' (1887); 'Harold's Bride' (1888); etc.

Tucker, John Randolph, American naval officer: b. Alexandria, Va., 31 Jan. 1812; d. Petersburg, Va., 12 June 1883. He joined the navy in 1826, and during the Mexican war took part in several operations. He resigned in April 1861, and became a commander in the Confederate navy, taking part in the engagements in Hampton Roads, including the conflict between the Monitor and the Merrimac. He was prominent in the engagement at Drewry's Bluff, and was soon after promoted captain and sent to Charleston, S. C., to command the naval forces. After the fall of that city he went to Virginia and organized the naval brigade, which he commanded until the retreat of the Confederate army from Richmond. He received a commission as rear-admiral in the Peruvian navy in 1866, and directed the combined squadrons of Peru and Chile in their war with Spain. Being made president of the Peruvian hydrographic commission, he instituted explorations and surveys of the head waters of the Amazon.

Tucker, Nathaniel Beverley, American lawyer and author: b. Williamsburg, Va., 6 Sept. 1784; d. Winchester, Va., 26 Aug. 1851. He was a son of Saint George Tucker; was educated at the College of William and Mary, studied law in Virginia, and practised there until 1815. Removing then to Missouri, he became a judge of the circuit court, and remained in that office until 1830. From 1834 to 1851 he was professor of law in the College of William and Mary. His published works include treatises on 'Constitutional Law' and 'Pleading'; various essays; 'George Balcome' (1836); and a novel, 'The Partisan Leader, a Tale of the Future' (1836), by which last his name and literary reputation are chiefly preserved. The scene of this striking tale was laid in Virginia in 1849, and in 1861 the work was reprinted as 'A Key to the Disunion Conspiracy,' in order to foster the opinion that the idea of secession had been entertained in the Southern States for at least a generation.

Tucker, Nathaniel Beverley, American educator: b. Winchester, Va., 22 Sept. 1867. He was graduated from the Virginia Military Institute in 1888, was appointed assistant professor there in that year, became adjunct professor 1890, and since 1895 has occupied the chair of geology.

Tucker, Samuel, American naval officer: b. Marblehead, Mass., 1 Nov. 1747; d. Bremen, Maine, 10 March 1833. He ran away to sea in boyhood, in 1768 commanded a merchant vessel plying between Boston and London, and on 17 May 1776 became a captain in the American navy. He settled at Bristol, Maine, in 1792, and in 1812 captured a British vessel off the Maine coast. He was a member of the Massachusetts legislature 1814–18, was one of the framers of the constitution of the new State of Maine (1819) and sat in the Maine legislature 1820–1. Consult Sheppard, 'Life of Commodore Tucker' (1868).

Tucker, William Jewett, American college president: b. Griswold, Conn., 13 July 1839. He was graduated at Dartmouth College in 1861, and after studying at the Andover Theological Seminary was ordained to the Congregational ministry in 1867 and installed as pastor at Manchester, N. H. He removed in 1875 to New York, where he became pastor of the Madison Square Presbyterian Church. In 1880 he accepted the Bartlett professorship of homiletics at Andover, and remained until he was elected president of Dartmouth in 1893. His administration has been marked by an enlargement and diversification of the curriculum; the development of the scientific department, and the consolidation of the Chandler School with the college. He has twice been the Phi Beta Kappa orator at Harvard; and has been Winkley lecturer at Andover and Lyman Beecher lecturer at Yale. In 1894 he was lecturer at the Lowell Institute, Boston. He assisted in founding and editing the 'Andover Review,' and established Andover House in Boston, a social settlement whose name has since been changed to South End House. His published works include 'From Liberty to Unity' (1892) and 'The Making and Unmaking of the Preacher' (1899).

Tuckerman, tŭk'ĕr-măn, Bayard, American author: b. New York 2 July 1855. He was graduated at Harvard in 1878, studied in Europe, and has since devoted himself to writing upon literary and historical subjects. He has also been lecturer on English literature at Princeton. His works include: 'History of English Prose Fiction' (1882); 'Life of General Lafayette' (1889); 'Diary of Philip Hone' (1889); 'Peter Stuyvesant' (1893); 'William Jay and the Abolition of Slavery' (1893); and 'Philip Schuyler, Major-General in the American Revolution.'

Tuckerman, Edward, American botanist: b. Boston 7 Dec. 1817; d. Amherst, Mass., 15 March 1886. He was graduated at Union College in 1837, and at the Harvard Law School in 1839. After a period of study in Europe he pursued another course at Harvard and later graduated from the Divinity School there. In 1854 he formed a connection with the faculty at Amherst College which lasted till the end of his life. In his earlier years his subject was history, but in 1858 he was transferred to the chair of botany, though he continued as a lecturer on history until 1873. He was the foremost authority in the United States on the subject of lichens. Tuckerman's Glen in the White Mountains was named in his honor. His scientific publications include 'Genera Lichenum: An Arrangement of the North American Lichens' (1872); 'A Catalogue of Plants growing without Cultivation within Thirty Miles of Amherst College' (1875); and 'A Synopsis of North American Lichens, Part I.' (1882).

Tuckerman, Henry Theodore, American author and critic: b. Boston 20 April 1813; d. New York 17 Dec. 1871. He contributed very largely to periodicals, and his writings were at intervals collected. He was best informed on topics of art, and his 'Book of the Artists' is yet valuable for reference. His works include: 'The Italian Sketch Book' (1835); 'Isabel; or, Sicily' (1839); 'Rambles and Reveries' (1841); 'Thoughts on the Poets' (1846); 'Artist Life' (1847); 'Characteristics of Literature' (1849–51); 'The Optimist' (1850); 'Poems' (1851); 'Memorial of Horatio Greenough' (1853); 'Bibliographical Essays' (1857); 'Art in America' (1858); 'The Book of the Artists' (1867); 'The Collector: Essays' (1868). He edited with William Smith 'A Smaller History of English and American Literature' (1870).

Consult the addresses by Duyckwick (1872) and Bellows (1872).

Tucson, tū-sŏn' or tŭk'sŏn (from the Pima styuk-son, "black or dark base," in allusion to a stratum in a mountain to the westward), Arizona, city, county-seat of Pima County; on the Santa Cruz River and the Southern Pacific railroad; situated 120 miles southeast of Phœnix and 500 miles east of Los Angeles, Cal.; lat. 32° 14'; lon. 110° 54'. Tucson is the largest city in the Territory and is in an agricultural and grazing region, but gains its chief importance as a resort for those afflicted with pulmonary ailments. Its altitude is 2,390 feet, and owing to the dryness of the climate (the precipitation from 1867 to 1902 averaging 11.29 inches per annum) the summer heat is not oppressive, although the temperature frequently rises above 100°, while the climate in winter is delightful. The modern part of the city is well built and has numerous attractive residences, church edifices, public buildings, hotels, and business houses; but the older part of the city bears the appearance of a typical Mexican adobe town. The chief industrial establishment is the shops of the Southern Pacific Railroad (disbursements about $150,000 per month), but there are also flour mills, an ice factory, a cracker and biscuit factory, and lumber and stock yards. It contains two national banks (capital, 1903, $50,000 each; total deposits, $1,260,000), and a territorial bank and trust company (capital $50,000, deposits $42,000). In 1903, 10,000 head of cattle were shipped by rail from Tucson. It is the seat of a Roman Catholic archbishopric, with a cathedral, and also of the University of Arizona (q.v.); it has a good public school system, several sectarian schools, and a Presbyterian boarding school for Indians, with 170 pupils; in addition there is a public library, housed in a building erected by Andrew Carnegie at a cost of $25,000. Tucson contains a number of churches of various denominations, and a Roman Catholic hospital and sanatorium. A Desert Botanical Laboratory has recently been established in the vicinity under the auspices of the Carnegie Institution of Washington.

When first known to history Tucson was a rancheria of mixed Papago, Pima, and Sobaipuri Indians, the missionary at San Xavier del Bac, nine miles down the Rio Santa Cruz, beginning to visit it for the purpose of converting the natives in 1763. In 1776 the Spanish presidio at Tubac was removed to Tucson, when it became known as the Presidio de San Agustin del Tuguison. In the early days the surrounding country was overrun and its inhabitants harassed by the Apaches. In September 1848, its population was 760; before the close of the year it was considerably augmented by refugees from Tubac and Tucumcari, who had been driven out by the Apaches, but by 1852 the number of inhabitants had dwindled to 300 or 400. Being within the limits of the Gadsden Purchase (q.v.), Tucson was garrisoned in 1856 by the First Dragoons, and on August 29 of that year a convention was held to take measures for a territorial organization of Arizona. From February to May 1862, the city was occupied by Confederate troops, in 1867 the capital was changed from Prescott to Tucson, where it remained until 1877, when it was transferred back to Prescott. (See Arizona.) The city was incorporated in 1877 and reincorporated in 1883. Pop. (1890) 5,150; (1900) 7,531.

F. W. Hodge,
Smithsonian Institution, Washington, D. C.

Tucuman, too-koo-măn', Argentina, the capital of the province of Tucuman, in the northern part of the country, situated near the eastern base of the Andes, 300 miles northwest of Córdoba. It has a delightful climate, is surrounded by orange groves and sugar plantations, and has a fine cathedral, a national college, a large hospital, libraries and a theatre. The chief industrial establishments are sugar factories, distilleries, and tanneries. The city is a centre for several railroad lines to Santa Fé, Rosario, Buenos Ayres, Córdoba and Salta, and is the principal trade centre of the northern provinces. Pop. (1895) 34,305.

Tudor, tū'dôr, one of the royal families of England. The line commenced with Henry Tudor, earl of Richmond, the grandson of Sir Owen Tudor, a Welsh knight of distinction, who, after the battle of Bosworth Field, was proclaimed king with the title of Henry VII. (q.v.), from him the crown descended to his son Henry VIII. (q.v.) whose son Edward VI. (q.v.), succeeded, and after him his two sisters, Mary (q.v.) and Elizabeth (q.v.). See also England, *History.*

Tudor, William, American author: b. Boston 28 Jan. 1779; d. Rio Janeiro, Brazil, 9 March 1830. He was graduated from Harvard in 1796, and entered the counting room of John Codman, in whose employ he visited Paris. He afterward made a tour to Italy and the continent, and on his return engaged in founding the "Anthology Club." In 1815 the first number of the 'North American Review' appeared under his editorship, and three fourths of the first four volumes were written by him. In 1819 he published 'Letters on the Eastern States,' in 1821 'Miscellanies'; and in 1823 'Life of James Otis.' In 1823 he was appointed American consul at Lima, and in 1828 made *chargé d'affaires* at Rio Janeiro, where he wrote a work published anonymously under the title 'Gebel Teir' (1829). He was one of the founders of the Boston Athenæum, and to him the country is indebted for the first suggestion of Bunker Hill monument.

Tudor Architecture, late Perpendicular work in England. There are three phases of this style of architecture, namely: (1) The Early Tudor, from the reign of Edward IV. to that of Henry VII. inclusive. Of this style there are no perfect buildings, and only few traces remaining. The Palace of Shene, built by Henry VII., has totally disappeared; but, according to the Survey of 1649, it abounded with bay windows of capricious design, with rectangular and semicircular projections, and was adorned with many octagonal towers, surmounted with bulbous cupolas of the same plan, having their angles enriched with crockets. (2) Tudor, in vogue during the reign of Henry VIII. The plan of the larger mansions of this period was quadrangular, comprising an inner and base court, between which stood the gate house. On the side of the inner court facing the entrance were the great chamber, or room of assembly, the hall, the chapel, the gallery for amusements, on an upper story, running the whole length of the

principal side of the quadrangle, and the summer and winter parlors. The materials were either brick or stone, sometimes both combined. Molded brickwork and terra-cotta were also employed for decorative purposes. Among the more striking peculiarities were the gate houses, the numerous turrets and ornamental chimneys, the large and beautiful bay and oriel windows, hammer beam roofs, and paneled wainscoting round the apartments. (3) Late Tudor, or Elizabethan, as seen in many country houses still standing.

Tuesday, the third day of the week, so called from the Anglo-Saxon god of war, Tiu, or Tiw. See TYR.

Tu'fa, a name applied to the cellular deposits from mineral springs. These are either silicious or calcareous. The former are classified under silicious sinter, the latter are called calc tufa or calc sinter. Calc tufa is a cellular variety of calcite in which the mineral matter has been deposited from the waters of springs around nuclei of leaves, twigs, mosses, etc. Tufa is to be distinguished from "tuff" (q.v.).

Tuff, a name properly applied only to finely divided particles ejected from volcanoes by explosive eruptions. The most notable illustration is the volcanic ashes which buried Pompeii. Such material may subsequently be cemented into a firm rock known as volcanic tufa.

Tufts College, located at Tufts College Station near Medford, Mass. It was chartered in 1852 and first opened to students in 1854; though established by members of the Universalist Church, it is non-sectarian in its policy and control. A notable feature of the first curriculum of the college was the special attention given to history; the policy has always been most liberal, and the courses have been constantly increased in number and broadened in scope in response to the tendencies of the modern educational development. Civil engineering courses were begun as early as 1869; and courses in other engineering departments added later; the first professional school was the Divinity School established in 1882; the Medical School was added in 1893, and the Dental College in 1899. All departments were open to women in 1892. The College organization now includes the following departments: (1) the College of Letters; (2) the Divinity School; (3) the Medical School; (4) the Dental School. The College of Letters includes academic, engineering, and graduate departments; the degrees conferred are A.B. and B.Ph.; B.S. for special courses in science and all courses in the engineering department; and A.M. and Ph.D. for graduate work. The courses leading to the degrees of A.B. and Ph.B. are largely elective, requirements being by groups, instead of by special subjects, and each group except English and physical training including electives; the science and engineering courses are more specialized in character, and include only a few electives. Shop work is included in the engineering courses. The Bromfield-Pearson School is designed to furnish instruction for those who are deficient in some of the studies required for entrance to the engineering courses, but fitted to pursue the college courses in certain subjects. The Divinity School offers a three years' course leading to the degree of B.D.; in 1902 an arrangement was made by which the A.B. course could be combined with the theological course in such a way that both degrees could be obtained in five years. The Medical School offers a four years' course leading to the degree of M.D.; the Dental School confers the degree of doctor of dental medicine; in 1902 its course was changed from three years to four. These two schools are located at Boston, occupying a large well-equipped building completed in 1902. There is also a summer school offering instruction in chemistry, mathematics, English and history; work done in the summer school can be counted toward the degree; the college also maintains a summer biological laboratory at South Harpwell, Maine.

There are 74 scholarships and four special scholarships provided in the collegiate department and 12 in the Divinity School. The government of the college is vested in a self-perpetuating board of 30 trustees; to give the alumni as a body a representation in the college administration, a board of overseers elected by the alumni was organized in 1899; changes in the departments of instruction and nominations to the faculty are submitted to the overseers by the trustees, and the overseers also have power to recommend action to the trustees. On the college campus there are (1904) 17 buildings; these are Ballou Hall, the Barnum Museum (built and endowed by P. T. Barnum), the Goddard Chapel, the Goddard Gymnasium, the Library, the Chemical Building, the Bromfield-Pearson School (containing the engineering shops), Robinson Hall, Miner Hall and Paige Hall (occupied by the Divinity School), three dormitories for men, East Hall, West Hall and Dean Hall, two for women, Metcalf Hall and Start House, the Commons Building and the power house. The general library in 1904 contained 48,000 volumes; in addition there are several special libraries, including the Universalist Historical Society collection (in Miner Hall) 5,400 volumes; the library of natural history (in the Barnum Museum) 1,700 volumes; the Metcalf musical library (in the Goddard Gymnasium) 1,600 volumes. The Medical and Dental schools also have libraries in their building in Boston, and students in these schools have access to the Boston Public Library. The productive funds in 1904 amounted to $1,900,000; the students numbered 950 (including the summer school), of whom 309 were in the College of Letters; the faculty numbered 175.

Tug-of-war, a game in which a number of persons divide into two parties; a line is marked out on the ground, and the two parties, laying hold of either end of a stout rope, try to drag each other across the line.

Tugboat, a small steam-vessel, powerfully constructed, used for towing large vessels in and out of harbors, and in rivers and canals. More than 1,000 of these are employed in New York harbor alone and are classed by boatmen under various names. Tugs are also of great service in forcing a channel through the ice; in rescue work if there is a wreck or a ship on fire; in transporting car floats for the railroad companies and in towing great rafts of logs.

Tugendbund, too'gĕnt-boont (German for "league of virtue"), a union ostensibly for the promotion of educational and social reforms, which was organized in Prussia in 1808, the real purpose being to free North Germany from the intolerable yoke of Napoleon. The Prussian

government was apprehensive that the Tugendbund might involve it in further difficulty with the French emperor, then virtually master of Germany, and suppressed the movement in 1809.

Tuguegarao, too-gā-gä-rä'ō, Philippines, pueblo, capital of the province of Cagayán, Luzon; within a few miles of the Grande de Cagayan River, 215 miles north-northeast of Manila. It is on the main highway to Manila and is the centre of a fertile agricultural region. It is well built, many of the houses being of stone; it has a large public square, a church, court-house and town-hall. Pop. 16,820.

Tuileries, twē'lē-rĭz, Fr. twēl-rē (named from the "tile-works," which originally occupied the site), previous to 1871 the royal and imperial palace at Paris, situated almost in the centre of the city on the north bank of the Seine. It was founded in 1564 by Catherine de Medici, wife of Henry II. Later monarchs extended it and altered the plans, until it became a large, complex structure, but with little architectural interest. It was stormed and sacked by the Paris mob in each of the revolutions, but was restored, and served as the residence of all the monarchs of the 19th century, including the two emperors. In 1871, however, it was set on fire by the Communists, and almost totally destroyed. Only the two eastern wings connected with the Louvre remain. The rest of the site has been converted into a public garden. See PARIS.

Tuke, tūk, Daniel Hack, English physician: b. York 19 April 1827; d. London 5 March 1895. He studied at Saint Bartholomew's Hospital College, London, and was graduated from the University of Heidelberg in 1853. He afterward made extensive tours on the Continent, visiting the principal asylums for the insane, and recording his observations, a practice he continued throughout his life. Upon his return from his first tour abroad he became visiting physician to the York Retreat for the Insane but was compelled to retire in 1859 because of failing health. In 1875 he removed to London and until his death was engaged as consulting physician in mental diseases. He was associate editor of 'The Journal of Mental Science' in 1878–92, collaborated with J. C. Bucknill in writing 'A Manual of Pyschological Medicine' (1857), and also wrote: 'Illustrations of the Influence of the Mind on the Body' (1872); 'Insanity in Ancient and Modern Life' (1878); 'History of the Insane in the British Isles' (1882); 'Dictionary of Psychological Medicine' (1892); etc.

Tuke, Henry Scott, English writer and religionist: b. York 1756; d. there 1814. He was a distinguished minister of the Society of Friends and wrote several works which are considered standard authorities in that denomination. Among them are: 'The Faith of the People called Quakers in our Lord and Saviour Jesus Christ, set forth in Various Extracts from their Writings' (1801); 'The Principles of Religion as Professed by the Society of Christians usually called Quakers, Written for the Instruction of their Youth and for the Information of Strangers' (1805); and 'Biographical Notices of Members of the Society of Friends' (1813).

Tuke, William English philanthropist: b. York 24 March 1732; d. there 6 Dec. 1822. He was devoted to mercantile pursuits, principally in the tea and coffee trade. Belonging to the Society of Friends, his attention was called, through the death of a fellow believer confined in the York County Asylum, to the necessity of ameliorating the condition of the insane. With his son Henry, Lindley Murray, and other Friends he secured funds for the opening of the York Retreat in 1796. In this institution began in England the modern humane methods of treatment, a reform that, unknown to Tuke, Pinel was carrying out contemporaneously in Paris. Inmates were no longer kept in chains; restraints and irksome discipline were removed; quiet surroundings with some industrial occupation were provided. After his death important legislation on the treatment of the insane was the direct result of his reforms.

Tukuarika, too''kwä-rē'kä. See SHOSHONEAN INDIANS.

Tula, too'lä, Mexico, a town in the state of Hidalgo, situated on the railroad, 40 miles west of Pachuca. It has a church and convent built by the early Spanish settlers, and in the neighborhood are extensive ruins supposed to be remains of the old Toltec capital. Pop. 5,000.

Tula, Russia, (1) Capital of Tula, on the Upa, 120 miles by rail south of Moscow. It is an important manufacturing place, has churches, museum, arsenal, and government offices, and an ancient Kreml. Its industrial works include a large gun factory, sugar refinery, dye-works, factories for bicycles, small arms, tea-urns or *samovars,* harmoniums, bells and mathematical instruments, besides manufactures of soap, candles, sealing wax, etc. Pop. (1897) 111,048.

(2) Tula, is a government of central Russia, whose area comprises 11,772 square miles. Its surface is mostly flat, and almost everywhere capable of cultivation. There are extensive forests, and the principal streams are the Oka, Upa, and Don. Canals connect the region with the Baltic, Black and Caspian seas. Agriculture and stock raising are important. Iron is extensively manufactured. Pop. (1897) 1,432,743.

Tulalip. See SALISHAN INDIANS.

Tulane, tū-lān', **Paul,** American philanthropist: b. Princeton, N. J., 6 May 1801; d. there 27 May 1887. He came of a distinguished family of French jurists, the probate judgeship of Tours having been in the Tulane family for 150 years. His father, Louis Tulane, came to America about 1795 and settled on a farm near Princeton, N. J., where his family lived for many years. Paul's early education was limited to a common school training, and he worked on the farm and, later, assisted in keeping a small grocery. About 1819 he went to New Orleans, settled there, and with the aid of a French cousin, then in America, opened a general merchandise store in 1822. By 1828 he had amassed a fortune of $170,000, a large amount at that time. He continued in a prosperous mercantile career until 1858, when he retired from active business, purchased a residence in Princeton, and divided his time between it and New Orleans for many years, continually increasing his property both in the Crescent City and at the North until his death. His interest in education appears to have been first awakened during the trip with his cousin in 1819 on observing several young Creoles from New Orleans on their way to Transylvania University, in Kentucky. He seems then to have been struck with the fact of the

lack of educational advantages for these young people at their home. This interest bore fruit in the fact that, entirely without solicitation, he formed in 1882 a group of friends into a body which incorporated itself as "The Board of Administrators of the Tulane Education Fund." To them he gave in trust a considerable property, without specific instructions except that the fund donated was "for the promotion and encouragement of intellectual, moral, and industrial education among the white young people in the city of New Orleans, State of Louisiana." By contract with the State, securing thereby exemption from taxation on its property, the Board thus formed took over the University of Louisiana, founded in 1832, the name of which was then changed to Tulane University of Louisiana (q.v.). His first gift for educational purposes in New Orleans consisted of his New Orleans real estate, valued at about $363,000. By subsequent gifts his endowment was raised to a total of $1,100,000.

Tulane University of Louisiana, located in New Orleans. This institution, under its present name, was created by Act No. 43 of the legislature of 1884. Its oldest department is the Medical College, which was organized as a private enterprise in 1834, and which was the first medical college in the Southwest. To this college the most distinguished physicians of that day gave their services; such men as Cenas, Harrison, Hunt, James Jones, Riddell, and Warren Stone. As yet there was no academic or law department, but in 1845, the first Democratic Constitutional convention that assembled in the State provided for the establishment of an institution to be known as the University of Louisiana, which should embrace as one of its departments the medical college already in existence, together with a department of law, a department of natural sciences and a department of letters. The State refused to bind itself to support the new university, but in the years following, the legislature appropriated about $100,000 for the equipment of the medical department and for a building to house it. The plans of the convention for the other departments were not realized until 1847. The first meeting of the board of administrators took place 27 April 1847. On 4 May of the same year, the board decided that law lectures should begin in November, with the following professors: H. A. Bullard, Richard H. Wilde, Theo. H. McCaleb, and Randell Hunt. On the 1st of June 1847, a committee was appointed to report on the organization of a department of letters and of natural sciences. The first president of the university, elected 21 July 1847, was Dr. Francis L. Hawks of North Carolina. In the same year the medical college gave to the law faculty its building (which stood on the present site of the Crescent Theatre), and removed to its new building (on the site of the present Tulane Theatre). The academic department existed only as a high school until 1851, when the college proper was opened with 12 Freshmen and 2 Sophomores. The medical college was the most successful department down to 1861, when the Civil War closed the university. At the close of the conflict the law and medical colleges were reopened, but the academic department had to await the close of Reconstruction. In November 1878 the academic department was revived under Dean Richard H. Jesse. Beginning in 1879, the State made an appropriation of $10,000 a year for its support, the first regular subsidy it had ever received. Private munificence, however, was now to take the place of State appropriations. In 1882 Paul Tulane, a former merchant of New Orleans, made a large donation for the higher education of "the white young persons" in the city of New Orleans. This donation was augmented until it amounted to more than a million dollars. The acceptance of this gift was followed by the absorption of the old University of Louisiana in the new Tulane University of Louisiana, which was effected by Act 43 of the General Assembly of 1884, and which has been ratified by the present Constitution (1898). As a *quasi* State institution the university is exempted from all taxation on its property, and in recognition thereof it remits all claim to the appropriation of $10,000, and gives a free scholarship to every legislative and senatorial district in the State. To the presidency of Tulane University the board called a distinguished soldier and scholar, Wm. Preston Johnston, who labored until his death in 1808, to enlarge the usefulness of the institution. He was succeeded in 1900 by Dr. Edwin A. Alderman, who, in turn, was succeeded in 1905 by Dr. E. B. Craighead. In 1886 Mrs. Josephine Louise Newcomb donated to the Tulane educational fund the sum of $100,000, "to be used in establishing the H. Sophie Newcomb Memorial College, in the Tulane University of Louisiana, for the higher education of white girls and young women." This endowment, to which Mrs. Newcomb added largely during her life and in her will, has enabled the board to offer to young women the same advantages formerly given only to men. In 1891 Mrs. Ida G. Richardson presented the medical college with a splendid modern building, equipped with every needed appliance for instruction in medicine and pharmacy. In 1900 Mrs. Caroline Tilton gave to the university the present beautiful library building. In the year 1894 the academic department, by a wise provision of the board of administrators, was moved from its old contracted quarters (on Dryades Street, near Canal), to a splendid site on St. Charles Avenue, opposite to Audubon Park. From its new environment it has drunk in new life.

JOHN R. FICKLEN,
Professor of History, Tulane University.

Tulé, too'lĕ, the Spanish-American name of a variety of the bulrushes, *Scirpus lacustris* and *S. tatora,* so common in the overflowed lands of the southwestern United States that those districts are called tulé lands. *S. lacustris* is a tall, large, smooth-stemmed rush with an umbel of flower spikelets, and with the leaves reduced to mere sheaths. It has a thick fleshy perennial rootstock, eaten by the aborigines, and which when sun-dried and powdered is said to keep well, and to be of good taste. Tulé seeds, also, are eaten; and the stems are woven into mats and baskets, and, like reeds, are used in great bunches to form the curious craft called balsas.

Tulip, a genus of bulbous herbs of the order *Liliaceæ.* The species of which about 80 have been described and 40 introduced into cultivation, are natives of temperate Asia, and some

have become naturalized in the Mediterranean region of Europe. They are characterized by tunicated bulbs, linear or broad radical leaves from the bases of which rises the scape three inches to two feet or more tall, and bearing at its summit usually a solitary bell-shaped flower, sometimes two, three or even four. These flowers are large, brilliant and showy, single or double, generally erect but sometimes nodding. Their colors are red, yellow, white and variegated in a great variety of tints and markings.

For more than three centuries the tulip has been popular in European gardens and prior to this period it was cultivated by the Turks for many centuries. In 1753 Linnæus grouped the garden tulips under the botanical name *Tulipa gesneriana*, which has since been erroneously cited as that of the original species. Another form (*T. suaveolens*) was named in 1797. It was well known in southern Europe prior to this date, but seems to have been an escape and was formerly distinguished from other tulips then cultivated by its earlier bloom, larger size, pubescent scape and fragrant flowers. Hence the conclusion that the earlier garden varieties are probably derived from the latter species, and the later ones probably from the former.

Interest in the tulip commenced in Vienna in 1554, when Busbequius, an ambassador to Turkey, procured seeds from a garden near Constantinople. From that time forward the popularity of the plant increased rapidly. In 1591, specimens of Clusius' varieties greatly stimulated interest in the plant in Holland, where the production of new varieties increased rapidly until it became a craze in 1634. From that date until 1637 the wildest speculation prevailed. Not only were enormous prices paid for individual bulbs, 13,000 florins (about $5,200) for a bulb of the variety *Semper Augustus*, but ownership was divided into shares, and many of the schemes known to the stock and bond market were in vogue, often without the existence of any bulbs at all. The government had at last to interfere but this was not until many families had been impoverished or even ruined financially. Since that time the popularity of the plant declined, but later reached the normal basis upon which it now rests, with its headquarters in Holland and Belgium. During the closing decade of the 19th century experimenters in the State of Washington have produced superior tulip and other bulbs, and will probably supply the American market.

The garden tulips are divided into four principal groups: selfs, in which the flowers are of only one color; roses, in which the petals show varying shades of red, scarlet, and pink; bizarres, in which the petals have yellow bases or centres and are bordered more or less widely with orange, red, etc.; and byblœmens, dark-colored flowers — purple, maroon, brown, black, etc. In these various classes about 2,000 varieties are listed by the European bulb growers, and they are further divided into singles and doubles, and except the selfs are segregated into feathered and flamed, according as the colors are intermingled in narrow or broad stripes.

One of the most remarkable phenomena about tulips grown from seed is that after the plants have commenced to produce blossoms for one or several years they "break"; that is, the colors and markings of the flowers change radically. A single-flowered self may become a double-flowered bizarre or rose, perhaps even showing no traces of the original tint. Owing to the length of time required to produce flowering bulbs from seed — three to seven years — this method of propagation is rarely practised except by originators of new varieties and by growers who supply small bulbs to fanciers and others. Named varieties are all propagated asexually, generally by offset bulbs which are usually produced freely. These do not "break" unless the progeny is obtained prior to the "breaking" of the parent bulb.

Tulips will grow in almost any garden soil, but will thrive best in well drained friable loam of moderate texture and richness. The bulbs should be planted in mid-autumn four inches below the surface. During the winter, in the North they may be mulched with litter, evergreen boughs, etc., to keep the frost in the soil and prevent alternate freezing and thawing. In spring when the weather has become somewhat settled the mulch should be removed and the surface smoothed with a rake. After blossoming the leaves should be allowed to turn yellow before the plants are dug, if they are to be dug, in order to allow them to elaborate food for the next season's bloom. If desired they may be left in the ground for two or three years. When taken up they should be cleaned, the offsets removed, dried in the shade, and stored in a cool dry place until planting time. For house and greenhouse use the bulbs may be planted in flats or pots as soon as received from the seedsmen, kept in a dark place until the roots are well produced and the tops commence to show; then they may be taken to a temperate room and gradually inured to both light and heat. After they have produced their blossoms they are usually thrown away because a fresh supply can be obtained so cheaply that the care usually required to "bring them around" again is considered wasted. However, they are sometimes planted in odd corners of gardens where some specimens will usually recover from the effects of the forcing.

Consult: Bailey, 'Cyclopedia of American Horticulture,' (New York 1900–2); Solms-Laubach, 'Weizen und Tulpe und deren Geschichte' (Leipsic 1899).

Tulip-tree, one of the handsomest and largest deciduous trees (*Liriodendron tulipifera*) in America, attaining its greatest dimensions in the Middle States, in deep moist, loamy soils. It is remarkable for its absolutely straight, massive trunk, sometimes tapering from a base, 20 to 25 feet in girth, to a height of 150 feet. The bark is regularly ridged, but is of fine texture and ashen-hued. That of saplings is very smooth, grayish-green, and mottled with gray. A tree grown in the open is of a symmetrical, pyramidal or spindle-like outline, with many diverging and upward sweeping branches. The foliage is very glossy, and bright green, the leaves peculiar in form, being nearly square, and three-lobed, the lateral ones rounded at the base, and the central one having a broadly-triangular notch taken out of its apex. They turn to a clear yellow line in autumn, and the leaves, trembling on long petioles, have caused this tree to be confounded with the poplars, in popular nomenclature. When very young, the blade is bent down against its stem, and is covered by two membranous boat-shaped stipules, which unite about the bud and do not separate and fall away until the tender leaf is able to endure the weather.

The tulip-tree is one of the magnolia family, and in June is covered with handsome flowers, which have suggested the generic name, meaning "lily-tree"; but the vernacular term seems more apt, since the six petals have the flaring, cup shape of the tulip. They are solitary, terminating the branchlets, and are yellowish-green outside, lined with orange, with a suggestion of a green star at the base. A ring of stamens stands inside, surrounding the column of carpels. The fruits persist long after the leaves have fallen, are like long samaras, hung by slender stalks, on the cone-shaped receptacle, and overlap it like inverted shingles. During the winter they are torn away and drift hither and thither.

The heartwood is classed among light woods, is easily worked, has a compact fine grain, and takes a high polish; when perfectly seasoned, it is durable and resists insects' attacks, but is likely to warp and shrink if not well dried. The color may be either white or yellow, and the wood is known as white or yellow poplar, the latter variety being the better. At one time used greatly for house-building, furniture, wooden utensils and many other purposes, on account of its lightness and strength, it is also valuable for carriage panels. Indians were said to have wrought it into long canoes, so regular and light were the trunks. An infusion of the bark when added to an equal quality of dogwood, is reckoned as a remedy for intermittent fevers, when alone as a substitute for cinchona and as a gentle cathartic. Many fossil species have been found, representatives of the *Liriodendron* type, of which it alone survives.

Tull, Jethro, English agriculturist: b. Basildon, Berkshire, 1674; d. near Hungerford, Berkshire, 21 Feb. 1741. He was educated at Oxford, and was called to the bar in 1699. He appears to have had political ambitions, but ill health compelled their abandonment and after an extended tour of Europe he settled on his estate and devoted himself to agriculture. In 1809 he removed to his farm near Hungerford which he christened "Prosperous Farm" and continued his experiments. He introduced the system of planting in rows and pulverizing the soil between them, but made the serious mistake of considering the finely pulverized earth and moisture sufficient for the growth of the plants and dispensed with fertilizing the soil, a system which involved him in serious losses. He invented the drill-plow and published 'New Horse-Hoeing Husbandry' (1733), a work which was long an authority in England.

Tullahoma, tŭl-a-hō'ma, or Middle Tennessee, Campaign. When Gen. Bragg after the battle of Stone River or Murfreesboro (q.v.) fell back from Murfreesboro he designed to hold the line of Elk River, but was directed to hold that of Duck River, north of which he disposed his forces; his infantry front extending from Wartrace on the right to Shelbyville on the left, with cavalry on the right at McMinnville and on the left at Columbia and Spring Hill. Polk's corps, on the left, held Shelbyville, which was well fortified, and a strong detachment was thrown forward about 10 miles to Guy's Gap. The greater part of Hardee's corps held Hoover's, Liberty and Bell Buckle Gaps, and part of it was at Tullahoma, 36 miles south of Murfreesboro, which was fortified and held as a depot of supplies. Bragg's position was covered by a range of high, rough, rocky hills, the principal routes passing southward from Murfreesboro toward Tullahoma and the line of his communication with Chattanooga, being the Manchester road through Hoover's Gap, the Wartrace road through Liberty and Bell Buckle Gaps, and the Shelbyville road through Guy's Gap, all of which were strongly held. His cavalry, under Gens. Wheeler and Forrest, was very active, attacking posts and detachments in Rosecrans' rear and on his flanks, breaking railroads and capturing wagon trains and in every manner harassing him, and to prevent which Rosecrans was but feebly prepared, having a much inferior cavalry force in point of numbers.

Early in January 1863, the troops of the Army of the Cumberland, under Gen. Rosecrans, were organized into three army corps, designated the Fourteenth, Twentieth, and Twenty-first, commanded respectively by Gens. Geo. H. Thomas, A. McD. McCook, and T. L. Crittenden. There was a reserve corps, under Gen. Gordon Granger, and a cavalry corps, commanded by Gen. D. S. Stanley. There were in the early months of 1863 many reconnoissances, which brought on several severe engagements, and the cavalry was kept busy by Wheeler and Forrest. Rosecrans was pushing his preparations for an active campaign and keeping up a fruitless appeal to the authorities at Washington for an increase of his cavalry force. By the middle of June he had decided upon a campaign to drive Bragg from middle Tennessee and fully informed that he was strongly intrenched at Shelbyville and Tullahoma determined to render these intrenchments useless by turning Bragg's right and moving on the bridge across Elk River in his rear, thus compelling his retreat or to give battle on open ground. He says: "To accomplish this it was necessary to make Bragg believe we could advance on him by the Shelbyville route, and to keep up the impression, if possible, until we had reached Manchester with the main body of the army. . . . The plan was, therefore, to move Gen. Granger's command to Triune, and thus create the impression of our intention to advance on them by the Shelbyville and Triune pikes, while cavalry movements and an infantry advance toward Woodbury would seem to be feints designed by us to deceive Bragg and conceal our supposed real designs on their left, where the topography and the roads presented comparatively slight obstacles and afforded great facilities for moving in force." Rosecrans had about 50,000 infantry, 6,800 cavalry and 3,000 artillery; Bragg 30,000 infantry, 14,000 cavalry, and 2,250 artillery. The campaign was opened by Rosecrans on 23 June, when Mitchell's cavalry division moved from Triune, and drove Wheeler's cavalry back upon the infantry with sharp skirmishing at Eagleville, Rover, and Unionville. At the same time Gen. Granger, with part of his own corps and Brannan's division of Thomas', moved from Triune to Salem, and the rest of the army was ordered to be in readiness to march next morning with a good supply of rations. On the next morning McCook started from Murfreesboro, on the Shelbyville road, and then moved to the left for Liberty Gap, which was seized before night by R. W. Johnson's division, after a sharp skirmish with a part of Cleburne's division.

Thomas advanced on the Manchester pike; Wilder's brigade of mounted infantry in advance drove some Confederate cavalry through Hoover's Gap to its southern extremity when it was fiercely attacked by infantry and held on until Thomas came up with infantry, when the Confederates withdrew, leaving Thomas in full possession of the gap. Two divisions of Crittenden's corps moved to Bradyville, near Woodbury. On the other flank Granger and Brannan advanced from Salem to Christiana, and Stanley, with a division of cavalry, moved through Salem and joined Mitchell at the intersection of the Salem and Christiana roads. During the day Mitchell had had a sharp encounter with Wheeler's cavalry at Middleton. Stanley, having driven Wheeler's cavalry back to Guy's Gap, on the 25th, joined Granger at Christiana. On the left Crittenden advanced to Holly Springs; Brannan joined Thomas at Hoover's Gap, and Rousseau's division closed up on Reynolds', which was skirmishing in advance of the Gap. During the afternoon three brigades of Stewart's Confederate division, attacked two brigades of Johnson's and one of Davis' at Liberty Gap, to regain it, under the impression that Rosecrans was intending to march his main body through it. The attack was repulsed with a Union loss of 231 killed and wounded; and a Confederate loss of over 400. On the 26th Thomas pushed the Confederates back to within five miles of Manchester; Crittenden followed Thomas; McCook remained at Liberty Gap, and Granger at Christiana. Thomas had gained so much ground toward Manchester that it was now practicable to concentrate the whole army there and force Bragg to abandon his position or give battle outside his works, and the concentration began on the 27th. Early in the morning Thomas seized Manchester, capturing a few prisoners, and at midnight had concentrated his entire corps at that place, 12 miles from Tullahoma. McCook withdrew from Liberty Gap, and marching through Hoover's Gap followed Thomas. The steady advance of Rosecrans' columns on Bragg's right convinced the latter that it was impossible to hold the long line to Shelbyville, so, early on the morning of the 27th, Polk was withdrawn from that place to Tullahoma, Wheeler, with the cavalry, being left to cover his rear. Stanley's cavalry and Granger's corps advanced from Christiana, drove Wheeler from Guy's Gap and pursued him inside the intrenchments four miles north of Shelbyville, where Wheeler made a stand with Martin's division to cover Polk's wagon tram then on the road from Shelbyville to Tullahoma. Wheeler was driven from the intrenchments by Minty's cavalry brigade and pursued into Shelbyville. He crossed Duck River and was about to burn the bridge when he was informed that Forrest, who had been ordered from Franklin to Tullahoma, was approaching with two brigades to join him, upon which he hurriedly recrossed to the north side of the river, with Martin, 500 men and two guns, and had scarcely crossed when the Union cavalry came charging right down the main street and toward the guns. These had been loaded with canister and were discharged when the Union cavalry were only a few paces from their muzzles. But the charging cavalry rode over Wheeler and his 500 men, took the guns and covered the entrance to the bridge. Wheeler ordered a charge, cut through a part of the thin Union line, dashed down the steep river bank and swam the stream. Wheeler, Martin, and some of the men escaped, about 50 were killed or drowned, many were made prisoners. Forrest had turned back when near Shelbyville and making a detour of eight miles crossed the river and marched to Tullahoma. It was dark when the action closed and the Union troops bivouacked at Shelbyville. As Bragg had now been forced from his first line on the right and from Shelbyville on the left, Rosecrans directed his attention to force him from Tullahoma back beyond the Tennessee. Thomas began the movement. Early on the morning of the 28th Col. Wilder, with his brigade of mounted infantry, started from Manchester to burn Elk River bridge and break the railroad south of Decherd, in the rear of Tullahoma, and to support the movement Col. J. Beatty's brigade marched to Hillsboro. The Elk River bridge was found too strongly guarded to warrant an attack and Wilder marched for Decherd, which was reached at 8 P.M. Wilder burned the depot and water-tank and had destroyed about 300 yards of the railroad, when he withdrew upon the approach of Confederate infantry. Next day he broke up the Tracy City railroad, and then dividing his force advanced toward Anderson and Tantallon, on the railroad to Chattanooga. Both places were held in such force that he made no attack and uniting his command at University he returned to Manchester on the 30th. When Wilder moved out on the 28th Thomas threw two divisions in the direction of Tullahoma and next day there was a general movement on the place and on the night of the 30th the advance was within two miles of it; the three corps of Thomas, McCook, and Crittenden closed up, and Stanley's cavalry had come over from Shelbyville and bivouacked at Manchester. The concentration was effected with great difficulty. When the campaign opened the weather was fair and the roads good, but on the second day a heavy rain set in which continued during the entire movement and the roads became almost impassable for artillery and the trains, making the operations exceedingly slow. On the 29th Bragg was reinforced by Gen. Buckner, with 4,000 men, from Knoxville, and he proposed to give Rosecrans battle at Tullahoma, but when his communications with Chattanooga were so seriously threatened, he concluded to withdraw, and on the night of 30 June abandoned Tullahoma and fell back beyond Elk River. Thomas advanced on the morning of 1 July and occupied Tullahoma, and Rosecrans ordered an immediate pursuit, but Bragg held the crossings of Elk River, the pursuit was abandoned, and Bragg continued his retreat over the Cumberland Mountains and across the Tennessee River to Chattanooga, leaving middle Tennessee again in Union possession. The nine days' campaign was one of the most brilliant of the war. Rosecrans loss was 84 killed, 473 wounded, and 13 missing. Bragg's loss in killed and wounded is not known. Rosecrans reports that he left in his hands 1,634 prisoners and 11 guns. Consult: 'Official Records,' Vol. XXIII.; Van Horne, 'History of the Army of the Cumberland,' Vol. I.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III.

E. A. Carman.

Tulloch, tŭl'ŏk, **John**, Scottish educator and ecclesiastical writer: b. near Tibbermuir, Perthshire, 1 June 1823; d. Torquay, England, 13 Feb. 1886. After study at Saint Andrews he became assistant minister at Dundee (1844), and principal and professor of theology at Saint Mary's College, Saint Andrews, in 1854. He edited 'Fraser' in 1879, and was dean of the Chapel Royal, London, in 1882. A broad theologian, and the founder of the Scottish Liberal Church party, he nevertheless championed orthodoxy, and opposed disestablishment. In 1872 he lectured in the United States. He published: 'Leaders of the Reformation' (1859); 'English Puritanism and its Leaders' (1861); 'Beginning Life' (1862); 'The Christ of the Gospels and the Christ of Modern Criticism'; 'Lectures on Renan's Life of Jesus' (1864); 'Theology and Greek Philosophy in England in the 17th Century' (1872); 'Pascal' (1878); 'Movements in Religious Thought in Britain during the 19th Century' (1885); and several volumes of sermons. He gained the second Burnett prize of £600 for an essay 'On the Being and Attributes of God,' which was published under the title 'Theism: The Witness of Reason and Nature to an All-Wise and Beneficent Creator' (1855).

Tullus Hostilius, tŭl'ŭs hŏs-tĭl'ĭ-ŭs, king of Rome in succession to Numa Pompilius (672 B.C.). He was a warlike monarch, in whose reign took place the combat of the Horatii and Curiatii. (See HORATII.) He subdued and utterly destroyed Alba by treachery. He likewise conquered the Fidenates and Sabines. His death, after a reign of 33 years, is ascribed by some to lightning, by others to assassination by Ancus Martius, his successor.

Tum'brel. See CUCKING-STOOL.

Tumeric Paper. See TEST-PAPERS.

Tumor (Lat. *tumor*, from *tumeo*, to swell). Terms frequently used in the same sense are new growth, neoplasm, malignant disease. A neoplasm or tumor in the narrower sense is a new formation of tissue, apparently arising and developing independently, atypical in structure, inserted uselessly into the body, possessing no function of service to the organism and showing no typical termination to its growth. (Ziegler.)

The frequency with which tumors occur, the resistlessness with which many of them carry their victims on to a painful death, and our ignorance in regard to their true nature, combine to render their study one of the most interesting and important departments of pathology. In spite of the enormous amount of research which has been devoted to this field we must admit that though the *histogenesis* or structure of tumors is now fairly well understood, their *pathogenesis* or underlying principle of causation is still shrouded in mystery. We have learned that the ultimate cells and tissues which make up the substance of these new growths are the same in type as those normally occurring in the body, and that each structural element of the tumor is derived from a pre-existing element of similar nature, but what was the force or stimulus which enabled these cells to break the laws of inter-relationship which ensure the normal development and function of each part of the body is still unknown. See CELL; DEVELOPMENT; HEREDITY; HISTOLOGY.

It is this tendency to assume an independence of existence and to flourish in opposition to the physiological restraints to which normal cells are subject in their growth and function, that characterizes tumors and forms the chief point of difference between them and certain inflammatory and other tissue proliferations. In short, a tumor is an overgrowth of tissues beginning locally, but frequently, by various methods of extension, invading near or remote regions, which is never of use to the body and frequently is directly hostile to it. The lower animals, particularly mammals, are subject to the same aberrancies of cell growth, and tumors comparable to those occurring in man are observed in all the vertebrates. Plants also exhibit analogous formations. See VETERINARY MEDICINE.

GENERAL CHARACTERS OF TUMORS.

As has been indicated, the integral structural units of tumors may always be traced back to normal types, and each class of new growths takes origin from corresponding normal tissues. Thus epithelial tumors spring from epithelial tissues, connective tumors from connective tissues, etc. Viewed as a whole a tumor is a true parasite, since it leads an independent existence, deriving nourishment from its host without in any way contributing to the latter's welfare. The processes of growth, nutrition, and cellular reproduction go on in tumors much as in normal tissues and they are provided with a connective tissue framework, blood and lymphatic vessels and nerves to provide for their vital needs. Interference with nutrition, or other causes lead to degenerative changes and necrosis, and inflammation, cicatrization, ulceration, etc., take place in their customary manner. A tumor may continue to increase indefinitely in size, or it may in some instances become quiescent in growth and remain without change for longer or shorter periods of time. The growth of the tumor goes on independently of the rest of the body and often is at its expense; thus a lipoma or fatty tumor may continue to extend in size even after the body's reserve of fat has become exhausted. Growth is effected by three different means: (1) By central or expansile growth due to increase of elements within the tumor, so that the surrounding tissues are pushed aside. This has been likened to the increase in size produced by inflating a rubber balloon. (2) By infiltration, that is, the outlying portions of the tumor push their way into the surrounding tissues as do the roots of a growing plant. (3) By metastasis. The importance of this method of growth lies in the fact that it represents the means of dissemination by which remote parts of the body may be invaded. The blood or lymph vessels are broken into and bits of tumor tissue travel to a greater or less distance till they lodge in some tissue or organ and form initial foci of secondary or daughter tumors. In carcinoma the adjoining lymphatic glands through their close connection with the lymph current are usually the first structures to be secondarily invaded. From a clinical standpoint it is usual to divide tumors into two great classes: (1) Malignant; (2) non-malignant. There is also a small group of neoplasms which stand between these two and are sometimes malignant and sometimes behave like benign growths. The malignant tumors (or what in popular parlance

are called "cancers") embrace the carcinomata and sarcomata and possess certain invariable characteristics: (1) Their growth is by infiltration and destruction of the surrounding tissues; (2) they form secondary growths by metastasis; (3) they are difficult to extirpate surgically and tend to recur locally; (4) they induce a general disturbance of health known as cachexia. By this is meant a condition of defective nutrition due wholly or in part to the demands on the body made by the growth of the tumor, to its interference with digestion or food absorption if situated in certain parts, as the œsophagus or stomach, to the loss of albuminous material through the constant discharge from ulcerating areas, to the absorption of deleterious substances arising from putrefactive changes in the tumor, to hemorrhage, to the pain and resulting loss of sleep, anxiety, etc. It is possible that the tumor itself produces a poison which contributes in producing cachexia, but portions of human carcinomata introduced into the tissues of experiment animals if free from bacterial contamination do not appear to exert any toxic effects.

The benign tumors, on the other hand, are distinguished by usually being encapsulated so that they can be easily extirpated, and through the absence of any tendency to form metastases. They are dangerous to life only through compression of important organs, but it must be remembered that their position may in this way give rise to most serious conditions. Many varieties are also extremely liable to become the seat of malignant degeneration.

THEORIES OF CAUSATION, AND THE OCCURRENCE OF TUMORS.

Comparatively little is yet known in regard to the actual causes of tumor formation. Many highly ingenious theories have been elaborated, but plausible as they may seem they are mere speculations and none of them can be said to be satisfactory from every point of view. Cohnheim in 1882 promulgated a doctrine which has many adherents and affords a rational explanation at least for congenital tumors and for many benign new growths. Briefly stated, his view is that during the development of the embryo (see EMBRYOLOGY) small clusters of cells become displaced from their normal surroundings and form little islets of tissue different in nature from their environment. These cells remain alive, but lie dormant until some stimulus stirs them into activity and they then form the nucleus for tumor formation. Having once started to proliferate they exhibit the intense vital energy of embryonal tissue and develop untrammeled by the restraints imposed upon normal cell growth. This theory has much in its favor, such as the tendency of many tumors to develop in regions which correspond to embryonal foldings, and to assume embryonal types of structure, but it is impossible to demonstrate any such displaced aggregations of cells, and clinical observations in many cases are strongly against it. A somewhat broader and more general view is taken by Ribbert, who believes that through some means, perhaps as the result of injuries or inflammation, numbers of healthy cells become cut off by bands of connective tissue and are thus isolated from the physiological restraints which ordinarily keep the cellular capacities within normal bounds. As a result of this liberty, excessive growth and perverted activity, in other words, tumor formation, occur. Hansemann denies that mere segregation of cell groups can have this result and accounts for the great intensification of vitality necessary by assuming a change in the individual cells, termed anaplasia, consisting in a loss of differentiation and increased capacity for independent existence. According to this writer two factors, anaplasia and a proliferative stimulus, are necessary for tumor formation. It will be seen that these theories leave much to be desired, but it is probable that the truth lies in this direction of cytological research and that as we gain a deeper insight into the physiology of the normal cell our understanding of these complex perversions of growth will be correspondingly increased.

Much has been written of late on the parasitic origin of tumors, particularly of carcinoma, and bacteria, yeasts and protozoa have all been described and figured in great detail as causative agents. None of these so-called cancer parasites has, however, been able to withstand the crucial tests of cultivation and of reproducing the tumors on inoculation into animals, and it has also been impossible so far to infect animals of one species with tumor tissue derived from another. Belief in the infectious nature of carcinoma is shared by very few observers at present, and it is probable that the instances in which carcinoma has occurred in people intimately associated, as husband and wife, are either due to coincidence or to direct transplantation of cancer cells. So-called "cancer houses" and cancer districts are described, but such observations are too fragmentary and unreliabe to be taken as the basis for generalizations.

Climatic, racial, and geographical features have been drawn into the discussion by some authors, as well as matters of diet; for example, habitual over-indulgence in meat. In connection with this latter point it is an interesting fact that carcinomata are said to be much less frequent in herbivorous than in carnivorous animals. On the other hand carcinoma is not uncommon among religious sects in the East that are strict vegetarians.

Injuries, both acute, such as blows and falls, and in the form of long-standing irritation, undoubtedly have some connection with tumor formation. Acute trauma is most often associated with tumors of the connective tissue group, and chronic trauma with carcinomata. Typical examples are found in the cases in which sarcoma follows bone injuries, and carcinoma of the lower lip is apparently produced by the constant irritation of pipe smoking or of a roughened tooth. Certain occupations which involve chronic irritation of the skin through chemicals, such as tar or paraffin products, also seem to predispose toward tumor formation. Too much importance must not be attached to this factor, however, for it has never been possible to produce tumors in animals experimentally in this way, and in the cases in which new growths have followed trauma there was probably some already existing predisposition.

Age.— The liability to different sorts of tumors varies very considerably with different periods of life. In childhood and in early adult life carcinomata are rarely seen and of the malignant tumors sarcoma predominates, while the reverse is the case after the age of 30. To

this rule there are many exceptions, however. When young people do acquire carcinoma the disease is always of extremely virulent type, whereas in the very aged its development is slower and in particular the formation of metastases is much less extensive.

Sex.— Carcinoma is much more frequent in women than in men and the organs of predilection also differ in the sexes. In men the tongue, lips, and stomach are oftenest attacked, while in women the disease is most commonly seen in the breast or uterus.

Heredity.— The tendency of modern pathologists is to ascribe less and less importance to heredity as a cause of tumor formation. Statistics are particularly misleading in this regard and while it is undoubtedly true that in a considerable proportion of cancer cases more or less remote members of the same family have been similarly affected, a like inquiry into the antecedents of healthy persons would show approximately similar results. A celebrated case is that of Napoleon I.— who, as well as his father and two sisters, died of carcinoma of the stomach. Carcinoma is a common disease and therefore appears frequently in the same family; sarcoma is rare and so has less appearance of hereditary transmission.

Increase of Malignant Disease.—The statistics of recent years show that throughout the world, but particularly in England, there seems to be a marked increase in the occurrence of carcinoma. Roswell Park says that if the ratio of increase in the number of cancer deaths in New York State continues unchanged for the next ten years the mortality from this cause will be greater than that of pulmonary tuberculosis, smallpox, and typhoid fever combined. These figures cannot be accepted without some reservation, however, for undoubtedly the diagnosis is now made in cases that were formerly unclassified, autopsies are more frequent and the causes of death are more definitely indicated in death certificates. Also through municipal sanitation, improved methods of medical treatment, more widespread dissemination of the laws of hygiene, etc., a greater number of people now live to reach the age when carcinoma is frequent. The increase seems to affect principally those of the upper ranks, in contradistinction to tuberculosis which spreads most actively among the proletariat.

In conclusion, it may be said that probably no one cause underlies the formation of all types of tumors, but that possibly widely differing factors may be concerned in the production of the different varieties.

CLASSIFICATION OF TUMORS.

Until our knowledge of the causes of tumors becomes more exact, a satisfactory classification is impossible. The so-called histogenetic classification based on embryological data is open to many objections, as well as various other systems proposed. The following table is taken from Delafield and Prudden's 'Handbook of Pathological Anatomy and Histology.'

Connective-Tissue Type.

Normal Tissue.	*Tumors.*
Fibrillar connective tissue.	Fibroma.
Mucous tissue.	Myxoma.
Embryonal connective tissue.	Sarcoma.
Endothelial cells.	Endothelioma.
Fat tissue.	Lipoma.
Cartilage.	Chondroma.
Bone.	Osteoma.
Neuroglia.	Glioma.

Muscle-Tissue Type — Myomata.

Normal Tissue.	*Tumors.*
Smooth muscle tissue.	Leiomyoma.
Striated muscle tissue.	Rhabdomyoma.

Nerve-Tissue Type — Neuromata.

Vascular-Tissue Type — Angiomata.

Normal Tissue.	*Tumors.*
Blood-vessels.	Angioma.
Lymph-vessels.	Lymphangioma.

Epithelial-Tissue Type.

Normal Tissue.	*Tumors.*
Glands.	Adenoma.
Various forms of epithelial cells, and associated tissues.	Carcinoma.

To these may be added the following two groups:

Teratomata and Cystomata.

It will be observed that the designation for each form is derived by adding the suffix *-oma* to the technical name of the corresponding tissue type, and for mixed tumors compound names are formed, as adeno-carcinoma, myxo-sarcoma, etc.

DIFFERENT VARIETIES OF TUMORS.

Malignant Tumors.

Sarcoma.— Sarcomata are tumors of the connective tissue group, composed of cells, embryonal in type, which are disproportionately numerous in comparison to the basement substance, so that the tumor as a whole is usually soft and pulpy in contradistinction to the stony hardness of carcinomata. They are characterized by extreme vascularity, the new formed vessels often being mere channels between the tumor cells, and the tendency to form metastases by means of the blood current rather than the lymphatics. Their cells may be of many varieties and the following chief types are recognized: (1) Large and small spindle celled; (2) large and small round celled; (3) giant celled; (4) melano sarcomata, which contain pigment, frequently arise from pigmented moles and are extremely malignant. Mixed tumors such as osteo-sarcomata, angio-sarcomata, etc., frequently occur. Sarcomata may arise from bone, the brain and spinal cord, the breast, the kidney, uterus, and lymph glands. They grow rapidly, owing to their vascular structure, are prone to necrotic changes, and if situated on the surface of the body break down and ulcerate. Sarcoma is not common, is a disease of early life, rarely appearing after the age of 40, and frequently is a sequel of injury or inflammation. In many respects sarcoma behaves like a growth due to some parasitic infection.

Carcinoma.— Carcinomata, or cancers in the true sense, are tumors composed of a more or less dense connective tissue framework, holding in its meshes epithelial cells. These exhibit much diversity of type and arrangement, so that several classes are recognized. (1) Epithelioma. This is the form which commonly occurs on the skin, at the muco-cutaneous junctions, such as the lips, about the nose and eye, and on the mucous membranes covered with squamous

epithelium, as the mouth, œsophagus, and cervix of the uterus. On the face a slowly growing form known as Jacob's or rodent ulcer, is sometimes seen which may last for years and is rarely fatal. On the skin or lip epithelioma begins as a warty protuberance which soon ulcerates and gradually extends in size until a sore with hard irregular base and edges, and foul bloody discharge, is formed. (2) Cylindrical celled carcinomata. These occur in the stomach, intestines, and uterus. (3) Carcinoma simplex. This displays great irregularity in the shape of its cells and is the commonest form attacking the internal organs. If the connective tissue is in excess, the dense, hard *scirrhus* carcinoma results; whereas if the cellular elements preponderate, the tumor is termed a *medullary* cancer or *carcinoma molle*.

About 80 per cent of the tumors of the female breast are carcinomata. The disease is rare before the age of 35, is most common between 45 and 55, and in women who have borne children. The negro race is much less susceptible. It begins as a hard nodular mass not painful to pressure, which soon becomes firmly fixed to the tissues and causes retraction of the nipple. The axillary lymph-glands are invaded early and can usually be felt as small hard nodules. In neglected cases the skin over the tumor ulcerates and there is a foul discharge. The arm becomes swollen and useless, and pain of neuralgic nature is usually present. The bones, liver, pleura, and brain are often attacked secondarily.

Carcinoma is usually disseminated by the lymph stream, and promptly invades the lymphatic glands. According to Birch-Hirschfeld the following are in order of frequency the organs most often primarily attacked: uterus, external skin, female breast, stomach, rectum, œsophagus, ovary, testicle, external genitals, prostate and bladder, pancreas, kidney, intestine, bile ducts, liver, bronchi. It is a disease of mature life and is not often seen before the age of 30.

INTERMEDIATE TUMORS.

Adenoma.— Adenomata correspond in general structure to normal glands, but either do not secrete or are unable to discharge the secretion through the gland ducts. They grow slowly, but may reach a large size, particularly if distended by accumulated secretion. In this case they are termed cyst-adenomata, and the oftentimes huge ovarian cysts belong to this class. Many goiters (q.v.) are adenomatous tumors. Adenomata are in themselves benign, but are prone to take on carcinomatous tendencies and then become very malignant. They occur in the breast, the ovary, the thyroid gland, the kidney, salivary glands, stomach, intestines, and uterus.

Endothelioma.—This tumor springs from the cells lining the blood vessels and lymph spaces and has much in common with both the carcinomata and sarcomata. Endotheliomata differ greatly in their virulence, but at times behave much as do sarcomata. They occur in the membranes of the brain, the pleura and peritoneum, the salivary and lymph glands. Growths of the parotid gland are frequently of this type.

BENIGN TUMORS.

Fibroma.— This is a growth composed of bundles of fibrillar connective tissue. Two main types, the hard and the soft, occur. Fibromata frequently appear in young adults, and may arise in any part of the body containing connective tissue. They are often seen in the skin, mucous membranes, the breast, in fibrous membranes, nerves and the gums, and are often associated with other forms of tissues in complex tumors. They are usually well encapsulated and may be single or multiple. Ordinary warts and moles and some nasal polypi are fibromata. One form not infrequent in women arises in the subcutaneous tissue, gives rise to severe attacks of pain, and is called painful subcutaneous tubercle. Keloid is a form occurring in scars, which is most common in negroes and is very hard to eradicate.

Myxoma.— This tumor is made up of tissue embryonic in type and called mucous tissue. Myxomata are soft and elastic, grow slowly and are usually considered benign, though they have a tendency to recur and sometimes undergo sarcomatous change. They frequently occur as polypi (see POLYPUS) in the nose, where they give rise to chronic catarrh, and are also found in glands such as the parotid and breast, the subcutaneous and submucous tissues and the sheath of nerves. Myxomatous tissue is often found in mixed tumors.

Lipoma.— Fatty tumors are among the commoner growths and are composed of lobules of fat held in a stroma of connective tissue. They are most often seen in middle life, and the skin of the back or shoulders is a favorite site. They may be multiple and sometimes occur as diffuse fatty enlargements about the neck. The yellowish patches often seen about the eyelids in old persons are a form of lipoma called *Xanthoma*.

Osteoma.— Osteomata are composed of bone and usually originate in bone, periosteum, or cartilage, though they may spring from other types of connective tissue. They grow slowly, are benign, and are often multiple. A special form known as odontoma or dentigerous cyst develops from the germ of the permanent teeth.

Chondroma.— This is most often met with in the young and is composed of hyaline and fibrocartilage. Chondromata may form from the long bones, the pelvis, cartilage, or in glands like the parotid and testicle. In the latter situations they are especially apt to become sarcomatous. Chondroma is frequently preceded by rickets in infancy. The so-called "joint-mice" or floating cartilages in joints are often pedunculated or broken off chondromata.

Glioma.— Gliomata are tumors developing from the neuroglia or supporting tissue of the central nervous system. They are found in the brain, spinal cord, and cranial nerves. Some forms, particularly those occurring in the retina during childhood, are closely allied to the sarcomata, and owing to its situation glioma is always a source of danger.

Myoma.— Two varieties of myomata are recognized: (1) Leiomyoma, composed of unstriped muscle cells and more or less fibrous tissue; (2) rhabdomyoma, which is rare, and contains striped muscle cells and spindle cells. Growths of the first class are found in the œsophagus, stomach and intestine, the skin, bladder, and ovary. They are commonest, however, in the uterus and its male analogue, the prostate gland. In the former situation they form the so-called uterine fibroids which often attain

large size and may menace health through hemorrhage or pressure on adjoining structures. The prostatic enlargement of old age is due to leiomyoma of the gland. Myomata are tumors of later life.

Neuroma.— Tumors composed of nerve tissue or true neuromata are rare, arise in middle life and are apt to be accompanied by severe pain or paralysis. False neuromata are tumors developing in the connective tissue sheaths of the nerves and may be fibromata, myxomata, etc. Traumatic neuromata are frequently the cause of the painful stump following amputations.

Angioma.— Angiomata are of two sorts: (1) Hæmangioma, consisting of dilated blood-vessels, and (2) lymphangioma, composed of dilated lymph-vessels. The first type is subdivided into (*a*) capillary hæmangiomata and (*b*) cavernous angiomata. Capillary angiomata or nevi form the so-called mother's marks, port wine stains, or strawberry marks with which infants sometimes come into the world. These are patches of distended cutaneous capillaries or venules, and if small can be obliterated by electrolysis. Larger ones are treated by excision. Cavernous angiomata are made up of large vessels and if on the surface of the body may form swellings of considerable size. Lymphangiomata are usually congenital, but may be acquired, and vary in size as do the hæmangiomata. With both classes of angioma there is danger of rupture and serious hemorrhage or escape of lymph.

Cystomata.— These are benign tumors filled with fluid the result of the activity of the cells lining the cyst wall, which is the real new growth. Many forms of cystomata belong to the adenomata, others occurring about the neck are the result of faulty closure of embryonic openings and are called branchio-genetic cysts. Cysts due merely to accumulation of secretion through stoppage of the duct of a gland, as the sebaceous cysts of the skin ("wens"), or resulting from parasitic infection as the hydatid echinococcus cysts (see HYDATID), are not grouped with true tumors.

Teratomata.— These are tissue formations of embryonic origin which frequently exhibit great complexity of composition, and contain such diverse structures as bone, teeth, skin, hair, cartilage, muscle, glands, etc. Cysts of this sort are called dermoids, and are especially common in the ovary and regions where folds of the developing embryo come in contact, as at the orbital angles, the neck and the base of the spine. Theoretically, teratomata are to be classed with the malformations rather than with the tumors. See TERATOLOGY.

THE DIAGNOSIS OF TUMORS.

In dealing with conditions likely to lead to results of such gravity as are involved in tumor formation, prompt recognition of the nature of the case is of the utmost importance. If taken at a sufficiently early stage both carcinoma and sarcoma can be cured by operation, and impending danger from benign growths be recognized and averted. Swellings and ulcerations about the face and especially the lips and tongue which do not promptly disappear are, in older people, most suspicious. The formation of hard masses in the female breast should also be called to the attention of the physician as soon as noticed, and excessive menstrual flow or hemorrhage between the periods in younger women suggests the possible existence of uterine fibro-myomata. A bloody or malodorous discharge subsequent to the menopause is very likely to be due to carcinoma of the uterus. Dyspepsia in older people together with loss of weight points toward malignant disease of the stomach, and indefinite abdominal pain, emaciation, obstinate constipation, or alternating diarrhœa and constipation, especially if there be blood in the stools, are strongly suggestive of a new growth of the intestine. It cannot be too strongly emphasized that delay is fraught with the greatest danger and may make cure impossible, or add immeasurably to the difficulties of the operation. In doubtful cases where tumors are accessible it is the custom of surgeons to excise small bits of tissue and submit them to microscopic examination to determine their nature. In obscure abdominal disorders an exploratory laparotomy may be the only means of establishing the diagnosis. The procedure itself is as free from danger as any surgical manipulation requiring a general anæsthetic can be, and if malignant disease is present it may be possible to eradicate it and save the patient from the miserable death which is otherwise inevitable.

THE TREATMENT OF TUMORS.

In general it may be said that for most tumors the proper treatment lies in their removal when feasible at the earliest possible moment. Modern surgery has made possible operations which formerly were unheard of and the chances of the patient afflicted with malignant disease are constantly improving. The older surgeons operated to prolong life or to make existence more bearable till death came as a relief: the surgeon of to-day operates to cure. Large portions of the stomach are frequently excised for carcinoma, and many cures are reported. Intestinal resection makes the extirpation of new growths in this region possible, while the technique of uterine operations has been developed to such a degree that fibromyomata can be removed with comparatively little risk, and even carcinoma in this situation has lost some of its terrors. Malignant tumors of the breast are permanently cured in from 40 to 50 per cent of the cases, the success being due to the thoroughness with which modern operators remove the tissues under the breast and the enlarged glands in the axilla, and statistics are showing constant improvement in the operative results in all forms of malignant disease. See SURGERY.

Various other plans of treatment are employed to some extent. Inoperable sarcomata have been greatly benefited by injections of bacterial toxins, and in the use of various forms of light-rays from the violet end of the spectrum, the X-rays and in the emanations from radioactive substances we have promising adjuncts to surgery. See PHOTO-THERAPY; RADIO-THERAPY.

Caustics are rarely successful in the treatment of malignant tumors and their application is always painful and leaves disfiguring scars. Charlatans of various types diagnose all sorts of conditions as cancers and proceed to cure them with great *éclat;* when actual malignant growths are encountered by them the time lost in this way before the necessity for proper advice is realized usually costs the patient's life.

Consult: Delafield and Prudden, 'A Handbook of Pathological Anatomy and Histology'

(New York 1904), which contains a full bibliography; Von Bergmann and Bull, 'A System of Practical Surgery' (New York 1904); Tillmanns, 'A Text-book of Surgery' (New York 1901).

KARL M. VOGEL, M.D.,
Assistant in Pathology, Columbia University.

Tu'mulus, an artificial mound, raised, as a rule, over the tomb of some prominent person. The custom appears to have been universal in the early historic period, and is clearly traceable to prehistoric times. As it required the use only of earth, and of rude stones for a sepulchral chamber, it was the only feasible method by which races in a low state of development could commemorate their dead, and partly for a similar reason, partly from traditional usage, the tumulus was continued after the use of metals had made it possible to construct sepulchral monuments of cut stone. In ancient as in modern times, where large numbers of dead were heaped together, and it was desired to honor them all, the tumulus was the only monument that could be conveniently provided. The vast grave at Salisbury, North Carolina, in which thousands of Union dead are interred, is a tumulus as much as any of the great burial mounds of the ancients.

The Bible and Homer give examples of tumuli. They are found in North America, Mexico, Central and South America, in Great Britain, and Scandinavia, in Asia and Africa. They are not in all instances burial mounds. The Bible, in Genesis xxxi. 44–55, relates the erection of a "heap," or tumulus, as evidence of an agreement as to boundary between Laban and Jacob. It is probable that some of the mounds were ancient forts. That at Silbury Hill, Wiltshire, England, 170 feet high, may not have been a sepulchre, and some of the American mounds were sacrificial, and others may have been places of defense. Indeed all three uses — sepulchral, sacrificial and defensive — may have been included in a mound. It is also certain that some tumuli are simply residential ruins, the crumbled remains of adobe dwellings, or, in the desert regions of Asia and Africa, sand heaps rising as the sole memorials of vanished and once populous cities. See MEGALITHIC STONES; MOUND-BUILDERS.

Tumut, tū'mŭt, Australia, the federal capital of the Commonwealth, selected by the Royal Commission in 1904, a picturesque hill-town in New South Wales, 318 miles by rail from Sydney, 389 miles from Melbourne, or about 12 hours' journey from either city. It is situated in a mountain valley 1,050 feet above sea-level, on the slope of a hillside rising from the south bank of the river Tumut, from which the town takes its name. The Tumut does not dry up like most Australian rivers, during the hot weather, but remains at continual high water mark owing to the melting snows of the neighboring mountains, the loftiest of which is Mount Kosciusko, the culminating point of the entire continent. The climatic conditions are those of a sanatorium, as compared with Sydney and Melbourne, while the abundance of water renders the vicinity of Tumut a garden all the year round, the vegetation never becoming the parched and withered spectacle so general throughout Australia in the heated season. Along the banks of the river, alluvial lands extend on both sides, with an average width of a little over three quarters of a mile. From the edges of these lands the ground rises gently into low ridges, which extend northerly and southerly to the future city site. On these ridges a large city can be built, with ample room for expansion in almost every direction.

The town as now constituted has four banks, four churches, curiously placed, as if they were the reflection of the pointer stars of the Southern Cross; a few schools, a lecture hall, and three inns. The principal buildings are of red brick, while the others are of the weatherboard, verandah fronted, corrugated iron roof variety. Pop. (1904) 1,400.

C. LEONARD-STUART,
Editorial Staff, 'Encyclopedia Americana.'

Tun. See TON.

Tu'na, a fish. See TUNNY.

Tuña, a cactus. See PRICKLY PEAR.

Tunbridge (tŭn'brĭj) **Wells**, England, in Kent, a watering-place and market-town, 28 miles southeast of London. It occupies detached hills with fine views and picturesque surroundings. At the end of the fine parade, the "Pantiles," are medicinal springs, which have been honored by royal and distinguished patronage since the 17th century. The large common contains 170 acres. The principal buildings are a church, public and society halls, convalescent home for children, mechanics' institute, Nevill's Club and Pump Room. Tunbridge ware, consisting of fancy inlaid work or mosaics, is sold extensively. The original town of Tunbridge (pop., 1901, 12,736), a wool-stapling centre, is four miles to the north. Pop. of Tunbridge Wells (1901) 33,388.

Tundra, toon'dra, the Russian name for the extensive low-lying, swampy peat-mosses which compose a considerable part of the great Siberian plain, and that of North Russia. From June till the middle of August the tundras are thawed to a small depth, and are seen covered with mosses and lichens, among which there are sprinkled a few flowering plants. Many furred animals, along with various migratory birds, resort to the tundras for the short summer season.

Tung'sten (Wolfram), a metallic element found in the minerals scheelite, wolframite, hübnerite. The pure metal is obtained by the Goldschmitt process (see THERMIT), that is, by the reduction of tungstic acid by aluminum filings; also by reduction of the oxide by heating with charcoal in an electric or regenerative gas furnace. It is malleable and hard enough to scratch glass. Not acted upon easily by mineral acids. Atomic weight, 183.6; symbol, W; specific gravity, 16.6. It forms a number of compounds, among which are the chlorides WCl_2, WCl_4, WCl_5, WCl_6, the oxide WO_3, and the acid $WO(OH)_4$. Tungsten is used extensively alloyed with other metals, as iron and aluminum, to which it imparts very desirable properties. Tungsten steel is very hard and tough, highly magnetic, not easily rusted, and has the valuable properties of self-hardening. The alloy of tungsten and aluminum known as partinium is very light and tough and is used largely in automobile construction.

Tunguses, toon-goo'sĕz, a leading branch of the Mongol division of the Mongol-Tartar family, small in numbers but extending over a vast area from the Pacific in the west to the Yenisei River in the east. The race is found along most of the seaboard from Korea and

Kamchatka, where a war was being carried on in 1904 between Russia and Japan. The Manchus, who conquered China, and are the rulers of that empire, are of Tungus stock, and from the same source came, in the remoter past, a large part of the savage and half-savage hordes that swept over lower Asia and western Europe. The Tunguses are now a dwindling race. Their morals are good, and their religion is chiefly the aboriginal Shamanism, although some have been converted to Christianity and Buddhism. Their name is said to be derived from a Chinese word signifying "people." The Tunguses on the higher Pacific coast are called the Lamuts, or "sea-people," and those in the vicinity of the Amur and Korea are called by the Russians the Tazi. The Tunguses, exclusive of the Manchus, are estimated at about 80,000 in numbers, of whom about 15,000 are in the Amur basin, and the others in Siberia. See MONGOLIAN RACE; SIBERIA; TUNGUSIC.

Tungu'sic, a language spoken over hundreds of thousands of square miles of Asia, by the people known as Tunguses. Manchu is a dialect of this language. It is a Mongol tongue, of a low grade of development, having no verbs, and possessing no distinction of number and person in the predicative words. See TUNGUSES.

Tunic, an ancient form of garment in constant use among the Greeks. Among the Romans the tunic was an under garment worn by both sexes (under the *toga* and the *palla*), and was fastened by a girdle or belt about the waist. The term is also used ecclesiastically to denote a dress worn by the sub-deacon, made originally of linen, reaching to the feet, and then of an inferior silk, and narrower than the dalmatic of the deacon, with shorter and tighter sleeves.

Tunica'ta, or **Urochorda,** a class of animals of the phylum *Chordata* (q.v.), commonly represented by the Ascidians (q.v.) formerly much misunderstood. Since Kowalewsky's description in 1866 of the development of an ascidian, it has been clear that these animals, together with all the other tunicates, must be associated in the zoological system with Amphioxus and the true vertebrates. Most tunicates pass through a free-swimming tadpole-like larval stage (and a few remain permanently in this condition), which has in the tail or swimming organ a notochord and a tubular central nervous system, both of which develop in essentially the same manner as in other vertebrates. The fore part of the alimentary canal is perforated by pores or stigmatæ opening to the exterior and serves as a respiratory organ. After a short free-swimming period, the larva attaches itself in typical cases and the tail is gradually absorbed with its contained organs, so that both notochord and tubular nerve cord disappear, a remnant of the latter in the body becoming the ganglion of the adult. The *Tunicata* comprise three orders: The *Larvacea,* including forms of small size and simple structure, which retain the larval tail throughout life. *Appendicularia* is an example found abundantly among the surface fauna of our coasts. The *Thaliacea,* including almost exclusively free-swimming pelagic forms which have no tail in the adult and seldom a tailed larvæ. They form compound colonies and exhibit an alternation of generations. *Salpa* (q.v.) is an example. The *Ascidiacea,* including usually fixed, simple or compound forms, with usually well-marked larvæ, but no tail in the adult state. *Molgula cynthia, Boltenia* and *Amaræcium* are common genera on our coasts. See ASCIDIAN. Consult: Herdman, 'Challenger Reports,' Vols. VI. and XIV., London (1882 and 1886); Verrill, 'Invertebrates of Vineyard Sound' (Washington 1874).

Tuning. See REED, FLUE, AND STRINGED INSTRUMENTS, CARE OF.

Tuning-fork, in music, a forked piece of steel constructed and tempered so as to give a definite note when caused to vibrate. Tuning-forks are small and easily carried in the pocket. They may be caused to sound by striking against the knee; the sound will be much strengthened by placing the handle in contact with a table. Large tuning-forks are used for lectures on acoustics, fixed on sounding-boxes, and caused to vibrate with a rosined hair-strung bow.

Tunis, tū'nĭs, or **Tunisie** (Fr. tü-nē-zē), North Africa, one of the old Barbary States on the Mediterranean coast, formerly tributary to Turkey, and now a French protectorate, bounded on the north and east by the Mediterranean Sea, on the south by Tripoli, and on the west by Algeria. It extends about 400 miles from north to south, 150 miles from east to west, and has an area of 38,450 square miles. The coast is indented by the three large gulfs of Tunis, Hammamet, and Gabes. It is bordered by a low, sandy and desert region in the east, and by precipitous mountains in the north. The northern part of the country is a plateau becoming very mountainous in the extreme north. The southern part is a flat steppe region, lying partly below sea-level, and containing large tracts of salt marsh. The principal river is the Mejirda, in the north. The northern mountains are covered with large oak forests, and contain very fertile valleys. The principal minerals exploited are salt, nitre, and phosphates, iron, lead, and mercury. Large numbers of cattle, sheep, camels and fine horses are raised. Agriculture is less developed, though climate and soil in the north are favorable. There is some vine and oil culture, and considerable fisheries along the coast, but the industries are not important. The principal commercial ports are Tunis-Goletta, Susa and Sfax. The chief exports are vegetables, oil, phosphates and mineral ores, esparto-grass, live-stock and cattle products, sponges, dyes and fruits. The total value of exports in 1901 was $7,800,000, and of imports $12,900,000. The head of the immediate government is the native bey, who rules under French protection. The capital is Tunis. The population is of a very mixed character, containing, besides the Moors, traces of the ancient Numidian, Phœnician, and Roman elements. The total population is about 1,906,000. In 1901 there were 38,889 French and 82,667 other foreigners. Tunis was a part of the ancient Carthaginian dominion, and afterward of the Roman province of Africa. In the latter part of the 7th century it was taken by the Arabs, and in 1575 it came under Turkish suzerainty. In 1881 France invaded Tunis under pretext of punishing the Krumir marauders. As a result of the invasion the bey was forced to sign the treaty making the state a French protectorate.

Tunis, North Africa, the capital of the French protectorate of Tunis, situated in the northeastern corner of the country, at the western extremity of a shallow salt lagoon connected

with the Bay of Tunis by a narrow channel at the port of Goletta. A canal, 5½ miles long and 22 feet deep, has been dredged through this lagoon to Tunis. The interior of Tunis presents generally a labyrinth of narrow dirty streets; but great changes have taken place since the French occupation, a European quarter with fine buildings, including the French residency, the public offices, Roman Catholic cathedral, etc., having arisen. Among the most interesting native buildings are the bey's palace and the mosques. The city has considerable manufactures of silk and woolen goods, shawls, mantles, and jewelry. There is now regular steam communication with Europe and the ports of Algeria, and a railway runs to Algiers. The ruins of ancient Carthage lie about 10 miles to the northeast of Tunis, and may be reached by railway. Pop. estimated at 170,000.

Tunkers. See DUNKARDS; GERMAN BAPTIST BRETHREN.

Tunnels and Tunneling. A tunnel may be considered an underground or sub-surface passage of any form of cross-section most suitable for the purpose of construction or for the purposes to be served after construction. It is ordinarily supposed to be constructed without disturbing the natural material over it or around it, although in some modern engineering works true tunnels are constructed by first removing the overlying material by open excavation if on land, or by dredging if under water, then constructing the tunnels by suitable means and refilling over the completed structure. Tunnels are of all sizes as well as shapes of cross-section and may be horizontal or inclined; indeed, a shaft may be considered a vertical tunnel. When tunnels are small and built ahead of the main structure or for subordinate purposes, as in mining, they are called headings or adits. Obviously, tunnels may be constructed for a great variety of purposes. They are commonly employed for railroad purposes, for the passage of foot and vehicular traffic under rivers as in the city of Chicago, for sub-surface transit purposes in large cities as in the city of London, to form aqueducts in great water supply systems, as for the city of New York with the 31-mile Croton aqueduct tunnel, for sewer purposes, and for serving other public conveniences or interests in modern communities.

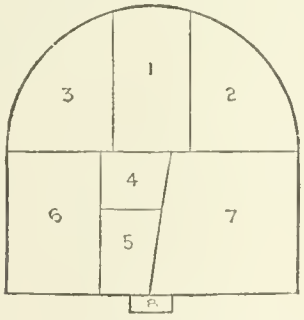


FIG. 1.

Ancient History.— The art of tunnel building is one of the oldest of engineering procedures. The ancient Egyptians built extensive tunnels for tombs and temples, and nearly or quite the same thing was done in ancient India. The ancient Assyrians constructed a tunnel under the Euphrates River, after having diverted its waters to another channel, the cross-section of which was 12 feet wide by 15 feet high. They also built other tunnels. The ancient tunnels were probably invariably built in rock or other hard material in which there was not sufficient water to give material trouble; there is no record of a true sub-aqueous tunnel being built in ancient times. Methods adapted to tunnel excavations through soft material saturated with water have been developed only in comparatively recent times. The old Romans were by far the greatest engineers of ancient times and they excelled all earlier peoples in their tunnel constructions as they did in all other constructions. The "fire-setting" method of tunneling was due to them as was also the method of sinking vertical shafts at different points on a tunnel line to afford a greater number of points of attack on the work. They built fires in their tunnels against the rock to be excavated, and, after heating it to the highest practicable temperature, suddenly chilled it by pouring water on it and taking advantage of the resulting softening, cracking and disintegration. They were also aware of the advantage of using vinegar instead of water in this method of tunneling through calcareous rocks, thus taking advantage of chemical action as well as disintegration by alternate heating and chilling. Probably the longest of the old Roman tunnels was that built to drain Lake Fucino; it was designed to have a section 6 feet by 10 feet. Forty shafts as well as inclined galleries were sunk for the construction of this tunnel 3½ miles long. The deepest shaft was about 400 feet. Most of the Roman tunnels were small, but they occasionally built large ones, like that for the highway in the Posilipo Hills between Naples and Pozzuoli, 3,000 feet long and 25 feet wide at the centre. The entrances are 75 feet wide and at the centre the height is 22 feet. Its general form, therefore, approximates the frustra of two cones with their small bases joined. This was for the purpose of concentrating the light in the central or less illumined portion.

In the Middle Ages.— Obviously the construction of ancient tunnels was excessively slow as well as laborious, although drills, chisels and even saws, fitted with hard cutting stones like corundum for teeth, were used even by the early Egyptians. Hammers and wedges were also employed. The first application of gunpowder of importance was probably at Malpas, France, in 1679–81, in the construction of the tunnel on the line of the Languedoc Canal, 510 feet long, 22 feet wide and 29 feet high. The first stimulating demand for modern tunnel construction of any great amount began with the construction of canals in France and England during the last half of the 17th century, and all of those tunnels were either in rock or dry hard ground. It was not until after 1800 that tunneling through sand and wet ground was undertaken in sufficient magnitude to be regarded as a branch of engineering construction. A tunnel for the Saint Quentin Canal

in France was built through soft soil in 1803. The width of this tunnel was 24 feet, and timbering including struts and planking was used to support the walls and sides prior to constructing the masonry lining. From the earliest times the necessity of lining tunnels with masonry was recognized and it was done wherever the material was of such a weak and uncertain character as to make its self-sustaining qualities doubtful.

Modern Tunnels.—The greatest stimulus of all to the construction of tunnels was given when the construction of railroads began. From that time until the present, tunnel works of great magnitude, including those through sub-aqueous material, have been constantly constructed. Among the earliest of these were two tunnels built on the line of the Liverpool and Manchester Railway in England. The first tunnel of any kind built in the United States was that known as the Auburn Tunnel near Auburn, Pa., built in 1818–21 by the Schuylkill Navigation Company for the water transportation of coal. This tunnel was several hundred feet long and was about 22 feet high by about 15 feet wide. The first railroad tunnel in the United States was also in Pennsylvania on the Allegheny Portage Railroad and was built 1831–3. It was 901 feet long, 25 feet wide and 21 feet high. What may be properly termed epoch-making tunnel structures in the United States and in Europe are the Hoosac Tunnel in Massachusetts and the Mont Cenis Tunnel which pierces the Alps between Piedmont and Savoy. These are termed epoch-making structures because the exigencies of their construction first brought into use power-drills and high explosives, the two great modern agents in rapid and economical rock tunnel construction. The Hoosac Tunnel was built between 1854 and 1876, the progress of the work having been interrupted over long periods. Its total length is about 4¾ miles and it is a double-track tunnel. The Mont Cenis Tunnel was built between 1857 and 1872 and has a length of 7.6 miles. This is a single-track tunnel. The beginning of the work on the Hoosac tunnel was quickly followed by the commencement of the double-track Erie tunnel through Bergen Hill, near Hoboken, N. J. This tunnel was built 1855–61 and has a length of nearly 4,400 feet. Its greatest height is 21 feet and its width 28 feet. Among the more prominent tunnels of this country driven through rock, there may be mentioned the Croton Aqueduct tunnel, 31 miles long with a horseshoe cross-section in general 13.53 feet high and 13.6 feet wide. The Niagara Falls Power tunnel, 6,700 feet long, has a horseshoe section 19 feet by 21 feet. The single-track Cascade tunnel on the Northern Pacific Railway, built in 1886–8, is 9,850 feet long. It is 16.5 feet wide and 22 feet high and is lined with masonry.

General Methods of Operation.—The more simple methods of excavating tunnels may evidently be employed for rock and firm earth or other materials relatively dry. In such cases it is customary to divide the cross-section of the tunnel into a number of parts and excavate them in such order as will be most conducive to economy and speed of completion. This division of the section into those parts successively excavated is illustrated by Figs. 1, 2 and 3. In each of those figures the numbers show the order of excavating the different portions, the part 1 being the first removed in each case. Fig. 1 shows the sequence of removal followed in the St. Gotthard tunnel, while Fig. 2 exhibits that followed in the Mont Cenis tunnel; Fig. 3 illustrates the order of excavation in the "German method" of tunneling. If the first part, numbered 1 in the figures, is in the top of the tunnel it is called a heading, but if it is at the bottom of the section it is called a drift. The heading or drift being first driven, the full tunnel section is reached by enlargement in the order or sequence shown. The usual width of heading is about 8 feet, although it may be but 6 feet. The height is about 7 feet. These dimensions give room for two men to work. Driving the heading is the most difficult and expensive operation of the tunnel excavation. These headings are sometimes driven 1,000 to 2,000 feet ahead of the full section, although that is not common. The alignment of the heading, which is also the alignment of the completed tunnel section, is transferred with great accuracy from the surface, either at the ends of the

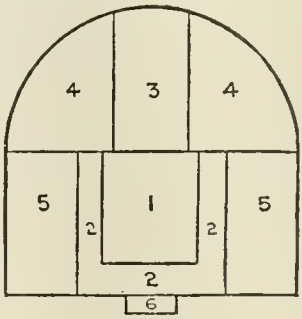


Fig. 2.

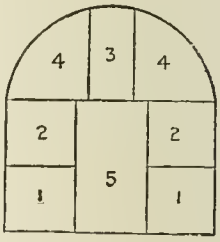
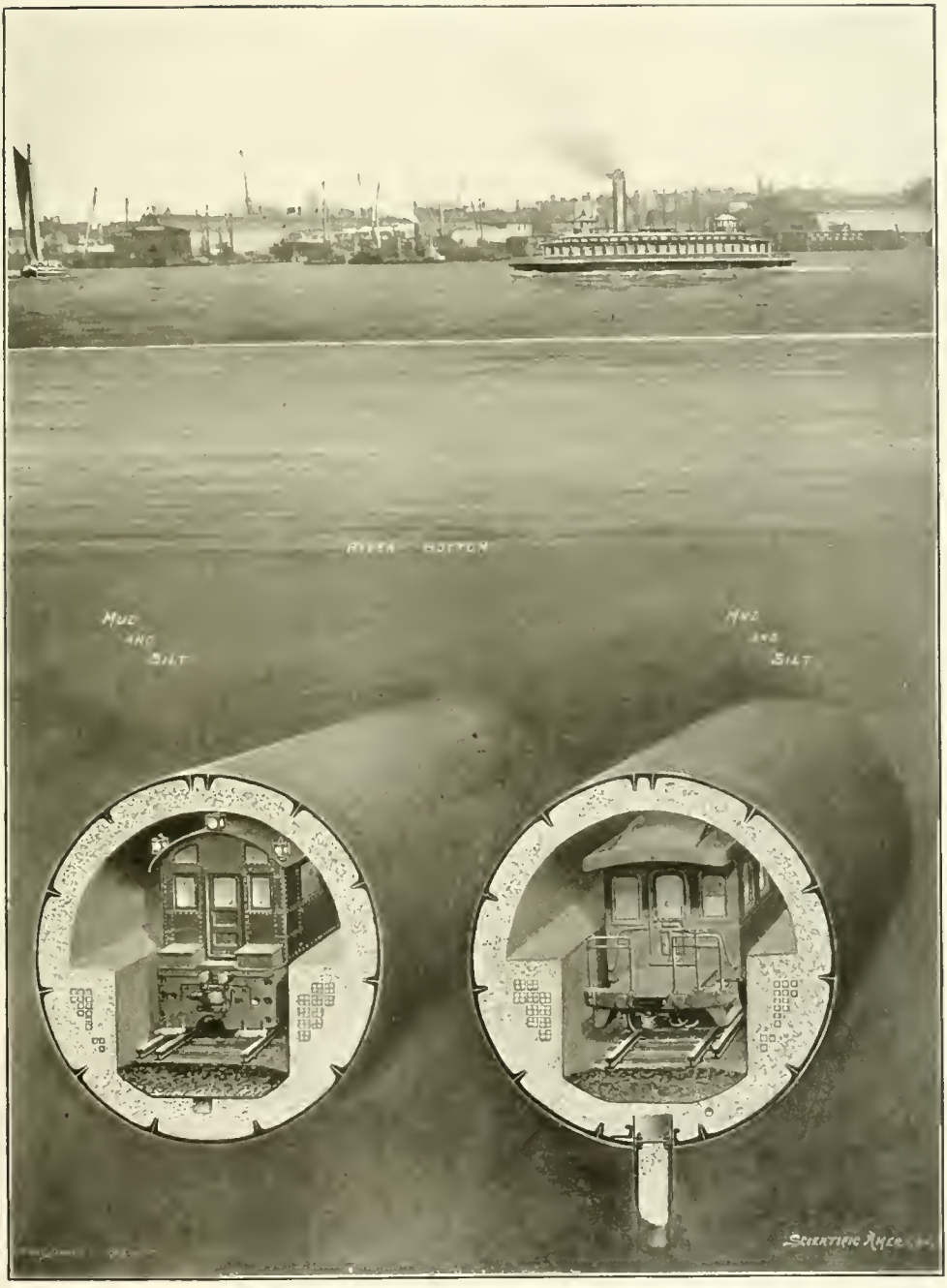


Fig. 3.

tunnel or down through shafts by various and well known methods of engineering surveying. Shafts are the vertical passages sunk from the surface along the centre line of the tunnel or at a short distance on one side of that centre line for the purpose of attacking the excavation at as great a number of points as possible. They enable the work to be extended both ways from the point where the shaft is sunk and also form points at which the excavated materials are raised from the tunnel; they also permit material for lining or other purposes to be lowered into the excavation and put in place. Central shafts are usually employed, although French engineers frequently adopt side shafts having their axes 30 to 40 feet on one side of the centre line of the tunnel. At the present time power elevators are used in shafts for raising and lowering men and material. When the shafts are left open and lined where necessary, they become permanent features of the completed structures, affording ventilation. Where shafts are filled after the work is completed they are called temporary shafts, and they may be circular in section as is usually the case where they are lined, or they may be rectangular, their sides being braced with



PENNSYLVANIA RAILROAD TUNNEL UNDERNEATH THE HUDSON RIVER.

timber to prevent material falling in. Central shafts are more convenient than side shafts. If water flows into the tunnel excavation or is found in shaft sinking, it must usually be pumped to the surface. Tunnels are usually classified in relation to the material in which they are driven, such as tunnels in hard rock, in loose soil, in quicksand, cut and cover tunnels, sub-aqueous tunnels. On the whole, hard rock is probably the safest material in which to drive a tunnel and it gives the least difficulty. This is true chiefly in view of the effective explosives and convenient power-drills and other machinery now available for the purposes of excavation. Rock tunnels may be driven by using either a heading or a drift, depending upon the local circumstances in choosing the method. Tunnels in soil may involve serious difficulties if the soil is saturated with water. The excavation may be first made near the top, that is, near the soffit (the Belgian method); or along the perimeter (German method); or in two halves entirely independent of each other (the Italian method); or, finally, the whole section together (the English and Austrian methods). The Belgian method is more frequently employed in Europe. After excavating the material under the soffit the arched roof of the tunnel is constructed and supported on either side of the excavation until the lower part of the material is removed, when the necessary side and bottom lining is completed. In the German method two drifts are driven, one on either side of the lower portion of the section, as shown in Fig. 3, then others are opened above them until the completed perimeter except the bottom, has been exposed. The masonry lining is then completed above the bottom. After removing the central portion of the material the invert or bottom of the masonry lining is put in place. The Italian method is more expensive than the others and is not often followed, but the English method is employed by excavating lengths from 10 to 25 feet, the masonry invert lining being completed first, then the side walls, and the top arch last. Tunnels in quicksand must be driven by methods applicable to soft soil saturated with water. Cut and cover tunnels have been more used for subways in cities than for other purposes. The most notable cases of these latter tunnels are the recently completed subways in the city of New York and the Boston subway, although a considerable portion of the latter was built without removing the material over the top of the finished arch. Sub-aqueous tunnels are the most difficult of all to build and require the employment of special methods and appliances which will be described later on.

Excavation.—The statement at the foot of this page shows the general character of excavation for the different kinds of tunnels to which allusion has been made. It is taken from 'Tunneling' by Charles Prelini, C.E.

To the preceding methods of sub-aqueous tunnel excavation there must be added the new plan successfully designed and executed by D. D. McBean, in the construction of the new subway double-track tunnel under the Harlem River which will be described further on. Finally, there is also the method of driving sub-aqueous tunnels by the freezing process which has been successfully used in Europe for shafts and which was designed to be used in tendering for the construction of the Pennsylvania Railroad tunnel under the North River at New York, by Charles Sooysmith, C.E.

The Timbering of Tunnels.—As excavations are made for tunnels not only in rock, but also frequently in soft material, it is necessary to support the sides and top of the excavation to prevent material falling in, and this support is usually given by timber struts and planking, called either lagging or poling boards suitably disposed concurrently with the excavation. As round sticks are more economical than sawed timber they are usually employed for this purpose. Methods of putting this timber in place vary largely

Methods of Excavating Tunnels

- In hard rock
  - By drifts.
  - By a heading.
- In loose soil
  - *By upper half:* The arch is built before the side walls. — Belgian method.
  - *By the perimeter:* Excavated and lined before the central nucleus is battered down. — German method.
  - *By whole section:* The lining begins after the whole section is excavated. — English method. Austrian method.
  - *By halves:* The lower half is excavated, lined, and filled in again, followed by the work of the upper half. — Italian method.
- In quicksand
- Open-cut tunnels
  - In resistant soils.
    - By two lateral narrow trenches.
    - By one very large trench.
  - In loose soils.
    - By slices.
  - Built up.
- Sub-aqueous tunnels
  - At great depths under the river bed.
    - By any method.
  - At small depths under the river bed.
    - By shield.
    - By compressed air.
    - By shield and compressed air.
  - On the river bed.
    - By coffer dams.
    - By pneumatic caissons.

with the methods of excavation employed and the sequence in which various portions of the tunnel are excavated. If the material is reasonably self-sustaining, as clay and much firm earth as well as most rock, the entire excavation may be completed closely in front of the timbering already in place if it is not desired to follow the excavation immediately with the masonry lining. In rock tunneling the masonry lining may usually be completed, where needed, immediately following the excavation without much or any timbering. In soft material, however, it is usually necessary to use timber supports, even for the first excavation, in the heading or drift. In fact, it is commonly necessary to insert poling boards, as they are called, ahead of the actual excavation, as shown in Figs. 4 and 5. The poling boards are inserted over the crown bar or top horizontal round stick of the bracing and under the block on which one end of the previous poling board rests, thus enabling the soft material to be excavated at the front part of the heading without the newly exposed material falling down. After the heading or drift is thus excavated and timbered, other portions of the cross-section are excavated concurrently with placing the supporting timbers, so that when the entire section is excavated there will be a complete system of supporting struts and cross timbers with the poling boards or lagging resting directly against the soft material of the sides and roof. These supporting timbers are so placed as to permit small dump or tram cars to be used for carrying out the excavated material. Obviously, the precise method of using poling boards will depend upon the manner or sequence in which the different portions of the excavation are completed and the kind of material found. It is equally evident that the poling boards and lagging may be used lengthwise of the tunnel or transversely, as shown in Figs. 4 and 5, the former necessitating the excavation of the least amount of material and being preferable in most cases. After thus completing the excavation and timbering, the masonry lining may be put in place, the timbering being removed as fast as the masonry progresses. The lagging and poling boards usually remain undisturbed back of the masonry lining. The timber which has been removed when the masonry is laid may be repeatedly used, not more than about 20 per cent of it usually being destroyed in any one use.

The Lining of Tunnels.— Reference has already been made to the masonry lining of tunnels. This lining may be constituted of almost any grade of suitable masonry, in accordance with its durability, strength and facility of being put in place. The kind of lining masonry is determined largely by the convenience and economy of the local supply. If the tunnel is in saturated water-bearing material the static head or pressure on the lining may be very great, and the thickness of masonry must be sufficient to carry that water pressure. Occasionally also there may be some little motion of the rock through which the tunnel is driven. In such cases the masonry lining must be of sufficient thickness to resist that movement. While no general rule can be given, the thickness of masonry lining may be from 1 to 4 or 5 feet, the least thickness being suitable for rock not very liable to fall and the greater thickness for such soft material as wet clay and sand and in cases where the static pressure of the saturating water may be very great. In some special locations for temporary purposes timber lining has been used, but it is not ordinarily employed for permanent work. Iron lining has also been employed under certain special conditions, but it is not often used for other than those methods of driving tunnels through soft material with the aid of the pneumatic process and the shield, the circular cast-iron lining being put in place immediately behind the shield. This cast-iron lining is made in sections with flanges for joints and for stiffening purposes which when put in place form a complete circle. These sections are sometimes not more than 2 feet by 4 feet, while in other cases they may be as much as 5 feet or 6 feet square. In all cases they are cast so as to form complete circular cylinders when put in place and bolted together.

The Pilot Method of Tunneling.— This method has not been extensively employed. It was introduced in 1880 by Anderson of Anderson and Barr, who used the method in the construction of the main relief sewer tunnel in Brooklyn, N. Y., in 1891. About 700 linear feet of this sewer has a diameter of 15 feet, 4,700 linear feet has a diameter of 14 feet, and 3,940 linear feet has a diameter of 12 feet, making 9,340 linear feet in all. The material penetrated was mostly sand and gravel, some of it being wet. The principal feature of the method is a wrought-iron cylinder of one fourth inch plate and 6 feet in diameter, the axis of which corresponds with the axis of the tunnel. This small 6-foot heading or pilot is the first portion of the tunnel excavated. The front end of the pilot was carried about 30 feet ahead of the completed tunnel section, allowing a 10-foot length of four-ring brick masonry lining to be put in place, while 15 to 20 feet of the pilot rested in unexcavated material. As fast as excavation was made at the front end of the pilot, plates were taken off the rear end which projected into the finished work and put in place at the front end. In this manner the pilot was carried ahead as fast as excavation could be made. In this case the pilot was built of one-fourth inch iron plates carrying 3-inch by 3-inch angles on their edges. The exca-

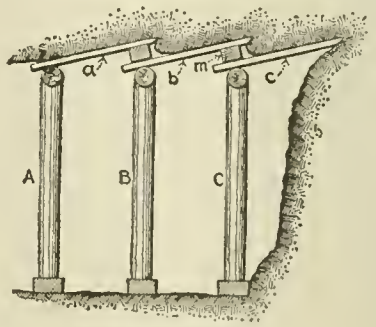
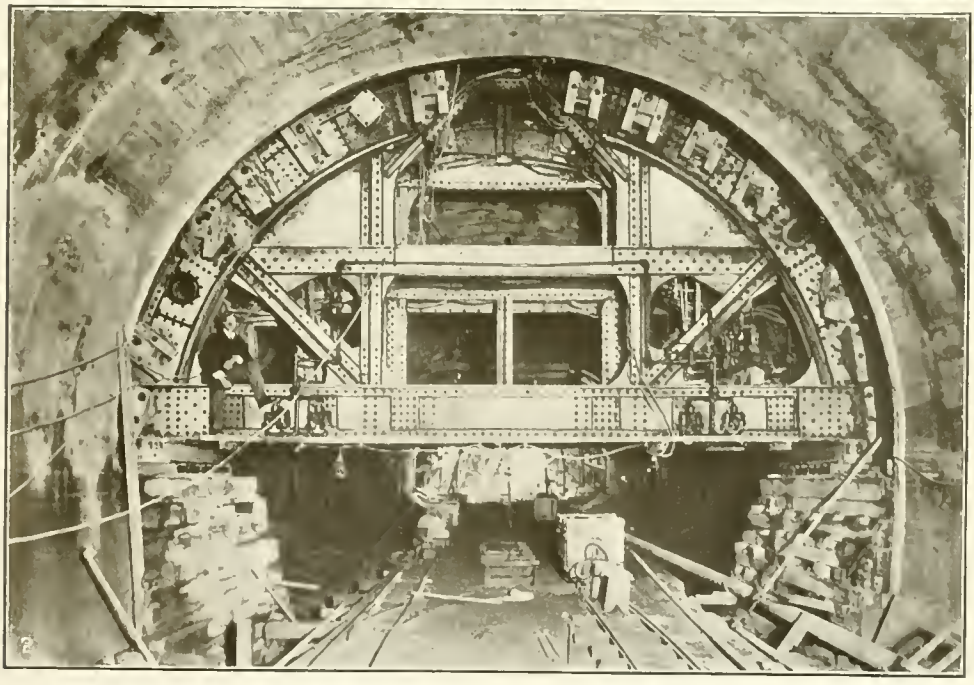


Fig. 4.



1. East Boston Tunnel, showing two upper superimposed drifts and earth core.
2. East Boston Tunnel. Rear of roof shield.

vation then made around the outside of the pilot was closely followed by radial struts with one end supported against the pilot and the other end carrying iron plates and lagging to protect the exposed face of the excavation. Iron plates were used over the crown of the finished excavation, but were not carried down on the sides, although they could be so extended if desired. In this manner the complete tunnel was successfully excavated and the material held back until the brick lining used in this case was in place. All work was done at ordinary atmospheric pressure. No other large work has been completed by this method, although it possesses advantages for many localities.

Baltimore Belt Line Tunnel.— This double-track tunnel is a part of the double-track line of railway in the city of Baltimore, Md., built for the Baltimore & Ohio and Western Maryland Railroads. It was driven through a great variety of materials, some of which were soft and saturated with water and gave much trouble. Rock was penetrated in some places and in others clay so hard and tough as to require blasting for its removal. For the greater part of its length, however, this tunnel was driven through soft material, some of which carried so much water that it was with difficulty that the work could be prosecuted without danger of serious settlements at the surface above it. In one case the settlement caused the destruction of a large building. The general plan of operations was that of the German method. Drifts along the sides of the tunnel were first driven, thus providing for the drainage of the upper part of the material to be removed. Portions of the side walls were built in these drifts and subsequently extended upward to the elevation of the springing line of the arch. The top heading was then driven and the adjacent side portions were immediately thereafter removed, thus completing the excavation to the full width of the upper half of the section. All these drifts and other excavated portions were heavily timbered and strutted so as to protect the exposed surface to the greatest possible extent. The illustrations show the method of strutting or bracing and the use of the poling boards employed. (Figs. 6 and 7.) In laying up the arch of the tunnel both iron and timber centres were employed. As is shown in the illustrations the masonry of the arch and side walls was laid up inside of the exterior line of round struts and the poling boards outside of them. The voids outside of the tunnel masonry were filled with rubble masonry so that no vacant spaces were left unfilled. The lining of the arch in general consisted of five rings of brick work, but where the soil was unusually soft eight rings were employed. The large amount of water in the material under the tunnel caused considerable difficulty in building the invert. Enclosures, however, of short sheet piling transversely across the tunnel were formed, within which the material was excavated and the foundation course of concrete 8 inches thick was laid. On this concrete foundation the brick invert was placed. One of the unique features of this work was the 6-inch perforated pipes which were inserted radially about 10 feet into the soft wet material surrounding the upper part of the tunnel where it was deemed feasible to resort to this procedure. Through these perforated pipes thin Portland cement, mortar or grout was forced into the surrounding soft material, so that when the Portland cement set a solid stiff mass of material was produced instead of the saturated and easily flowing natural material. The bottom side drifts and the masonry walls built in them were ordinarily carried about 20 feet ahead of the arch, although at times this work was as much as 90 feet in advance. The arch was usually built in complete transverse sections about 18 feet in length.

General Features of Method Used in Quicksand.— The construction of the Baltimore Belt Line tunnel illustrates some of the general features of method suitable for use in quicksands and other soft materials. Quicksands are simply fine sands mixed to some extent with fine clayey matter and saturated usually with running water. All wet material is soft, and in tunneling through such material the first effort is to drain that part of the excavation as effectively as possible. This is accomplished by driving either a centre bottom drift or, as in the Baltimore Belt Line tunnel, two bottom side drifts, all of which are well calculated to drain the material above them. If the water does not flow away from these drifts by gravity it may be led into sumps and removed from them by pumping. After this draining is accomplished the remaining material is taken out by some method such as those already described, timber bracing or strutting being introduced concurrently with the excavation. Poling boards are constantly used to keep the material from falling into the excavation and the joints between them are frequently packed with hay or material of similar character so as to permit water to enter without bringing with it the soft material. The masonry lining is then put in place as already described in connection with the Baltimore Belt Line tunnel, frequently leaving the exterior line of strutting and the poling boards in place. The hardening of soft material may also be produced in other ways than by injecting Portland cement grout, as by freezing or by stock ramming.

Sub-aqueous Tunnels.— All the preceding methods of tunneling described pertain to tunnels not driven below open water, although the material which they penetrate may be fully saturated with water. The most difficult tunneling is that which must be carried on at considerable depths below the surface of free water above the work. In such cases the water finds its way through either porous material or through crevices or fissures in the overlying rock so that both the completed tunnel and the work in progress are subjected to a water pressure represented by the static head of the water above them. Occasionally in rock tunneling under such conditions or in stiff clay, water may flow in upon the work in quantities not too great to make its removal by pumping feasible. When, however, water enters too freely for such procedures, compressed air must be used to keep the water out, the pressure of air being determined by the depth of the

work below the water surface. When tunneling is prosecuted under these conditions a "shield" is ordinarily used, as will be described further on. An instance illustrating the method to be followed in sub-aqueous rock tunneling will first be given.

The Severn Tunnel.— This tunnel, a double-track tunnel, a little less than 4½ miles long, was built under the river Severn in the southwestern portion of England between

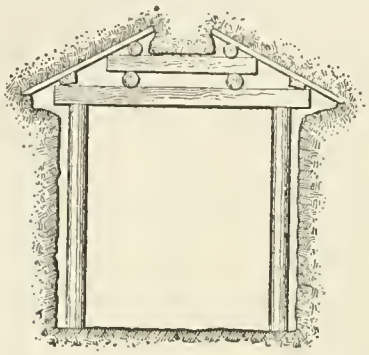


Fig. 5.

1873 and 1886. Although this tunnel was built largely through rock, for a short distance the material penetrated was gravel. The bed of the river at the tunnel site is composed of strata of conglomerate limestone, carboniferous beds, marl, gravel and sand. The least thickness of the natural cover over the tunnel is 30 feet of marl on the English side of the river. At the deepest part of the river channel the thickness of the sandstone over the tunnel is about 45 feet. The entire tunnel is lined with vitrified brick work 2¼ to 3 feet thick, laid in Portland cement, the invert having a thickness of 1½ to 3 feet. Much water was encountered in the prosecution of this work which produced grave difficulties. Indeed, at one time the entire work was flooded for a period of 13 months. The water gave much trouble at other times, breaking through in large volumes, but in no other instance was the work suspended on account of the water for a period of more than a few weeks. Pumps were employed to raise the water through a side heading connecting with a shaft 29 feet in diameter. The greatest amount of water raised concurrently by all the pumping stations was about 27,000,000 gallons in 24 hours, although the total pumping capacity provided was equivalent to about 66,000,000 gallons in 24 hours. The ventilation of this tunnel, which is a matter of great importance on account of its length, is accomplished by a fan 40 feet in diameter in one of the shafts, making 43 revolutions per minute and drawing out about 447,000 cubic feet of air per minute to an 18-foot shaft near to the work.

Tunneling by the Use of a Shield.— The method which has been employed more than any other for sub-aqueous tunneling in soft materials is that which it is believed was first devised and applied by the great French-English engineer, Sir M. I. Brunel. Brunel was born in France in 1769, spent six years in the United States, then went to England and became one of the greatest civil engineers of Great Britain, where he died in 1849. He secured his first patent covering the use of a shield for sub-aqueous tunneling in 1818. He first employed a shield in the effort to build a tunnel under the Thames River at London in 1823. His first shield was found to be too weak in actual service and had to be replaced by another and somewhat larger one designed by and built under the direction of Brunel himself. This shield was rectangular in transverse section, 37 feet 6 inches wide by 22 feet 3 inches high, and by the use of it two parallel tunnels of horseshoe shape were built, each being 13 feet 9 inches wide and 16 feet 4 inches high, the two being separated from each other by a wall 4 feet thick. This dividing wall was not continuous, but was pierced by arch openings, each about 4-feet span about every 20 feet. The total structure built of brick work was 38 feet wide over all and 22 feet high. The tunnel was finished in 1843, making the total time of construction, including all stoppages and delays, 20 years. Another English engineer, Peter W. Barlow, patented in England in 1865 a method of sub-aqueous tunneling by the use of a circular shield with a cylindrical cast-iron lining for the completed tunnel. After 1869 he was associated with the English engineer, James Henry Greathead (1844–96), in the construction of the tunnel under the Tower of London, 1,350 feet long and 7 feet in diameter, which penetrated compact clay and was completed within a period of 11 months. This was a remarkable record in tunnel building, and from that time until the present numbers of tunnels in soft material under water have been constructed on what is commonly known as the Greathead system, which simply means the use of a cylindrical or circular shield, developed from Brunel's original plan and subsequently perfected by Greathead.

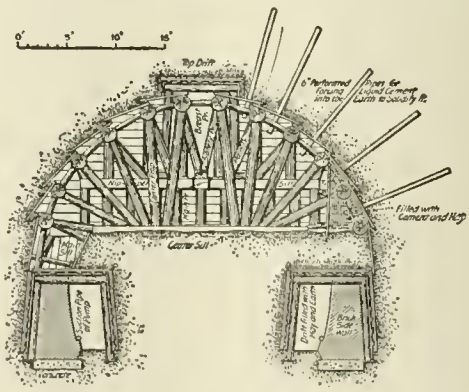


Fig. 6.

The use of the shield has made it possible to construct tunnels under rivers at depths below the surface of the water as great as the effect of compressed air on laborers will permit, it being a matter of comparative indifference how soft the material may be, except that the softer or more easily flowing the material the more carefully must the work be executed. The shield is composed of a cylindrical shell usually constructed at the

present time of steel plates and angles or other shapes with a heavy braced diaphragm placed at right angles to the axis of the shell. This diaphragm is of heavy steel plate and shape construction. It may have a number of openings in it closed by doors or other suitable devices. These openings in the diaphragm permit laborers to excavate the material immediately in front of the shield. If the tunnel is a large one the openings may have platforms in front of them, on which laborers stand in order to make the desired excavation through the openings themselves. If the material being penetrated is very soft and porous an inrush of water may take place even when compressed air is used, and the diaphragm must be strong enough to resist the resulting pressure. It may be, and usually is, heavily braced with plates and angles, both vertical and horizontal. The illustrations show how complicated its construction may be. The cylindrical shell in which the diaphragm is located may extend from one to 10 or 12 feet in front of the diaphragm and from 6 or 8 to 26 or 27 feet behind it. The tunnel lining, usually of cast iron from one inch to two inches in thickness and possibly lined with masonry, is constructed within the rear or tail of the cylindrical shell, so that the latter always overlaps by two or three to four or five feet the finished lining of the tunnel, thus preventing any material or water falling into the completed work. Obviously as the workmen excavate the material in front of the shield, pass it through the diaphragm and take it out in the rear, the shield must be moved forward so as to bring its front end again up to the face of the excavation. As these shields are very heavy masses of steel, weighing sometimes 40 to 80 tons or more, and as the friction of the surrounding material on the sides of the shell must be overcome, a heavy force is needed to make the movement. This force is usually supplied by hydraulic jacks so devised and placed around the circumference of the diaphragm as to push against the completed iron lining of the tunnel. These jacks have cylinders six inches or more in diameter and are actuated with water or other liquid at a pressure of 1,000 to 3,000 or 4,000 pounds per square inch. A shield about 21.5 feet in diameter was used in the construction of the Sarnia tunnel under the Saint Clair River above Detroit, Mich. This shield was moved by 24 hydraulic jacks, as shown in the illustration, each having a capacity of 125 tons and so placed as to press directly upon the cast-iron tunnel lining behind it. By such means the shield may be pushed ahead as fast as the excavation is made and the tunnel lining completed behind it. (See plate.)

The Saint Clair River tunnel is a single-track railroad tunnel built in 1890–1 by the Grand Trunk Railroad. The total length of the tunnel is 6,000 feet, made up of 1,162 feet on the United States side of the river, 844 feet on the Canada side of the river, and 2,310 feet under the Saint Clair River. It is built through the clay underlying the river and has a clear inside diameter of 19 feet 10 inches, the cast-iron shell being two inches thick and having an outside diameter of 21 feet. The cast-iron shell is lined with six inches of brick and cement. The shield is 15 feet 3 inches long and required from 450 to 2,000 tons to move it during construction. The maximum daily progress through the clay was 15.3 feet. The average monthly progress was 230.4 feet from the American side and 219 feet from the Canadian side.

The transverse section of a shield may be circular, elliptical, or any other shape; it may even be rectangular, as in the case of Brunel's Thames tunnel. The shield for the Clichy sewer tunnel in Paris was elliptical in outline.

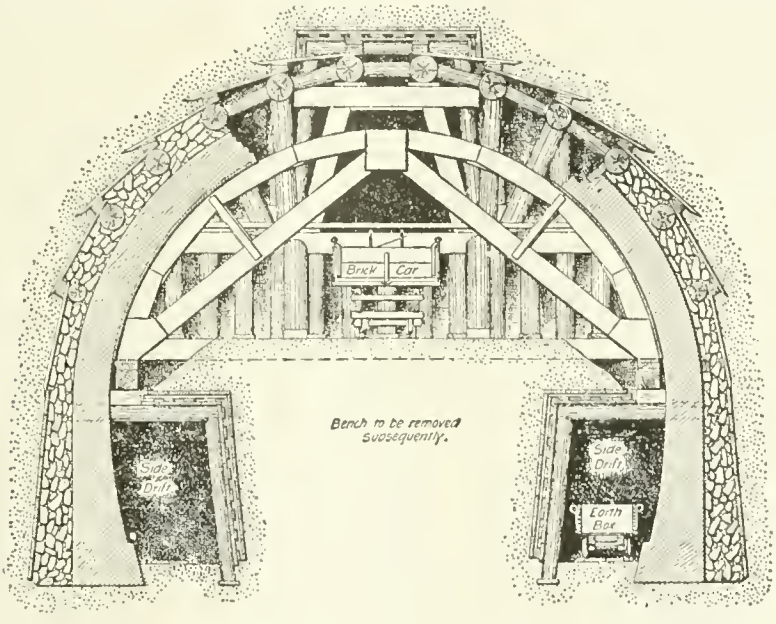
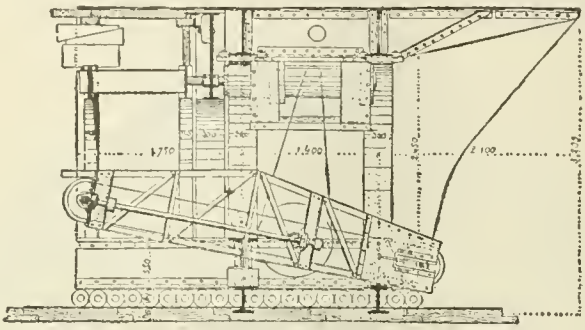


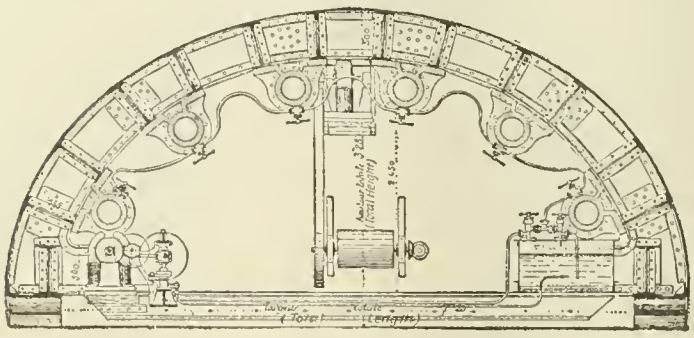
FIG. 7.

Again, if the material is not too soft, the shield may be segmental only, that is, comprising but a part of the outline of the full shield, usually the upper part. The shield for the use of the East Boston tunnel recently constructed was segmental and was used for the roof of the tunnel only, as is also shown in the illustrations. The front portion of the cylindrical shell, consisting of the front portion of the shield as a whole, may be vizor-shaped if material is not too soft. In such a case the upper part of the fresh excavation is protected by the vizor extension of the shield. Where the material is stiff enough to hold itself up for a short time the front extension of the shell is not needed.

It is thus seen that the purpose of the shield is to prevent the inrush of water and soft material while excavation is being made, the diaphragm of the shield acting as a bulkhead and the openings in it being so devised as to be quickly closed if necessary. The extension of the shield in front of the diaphragm is designed to prevent the falling or flowing in of the exposed face of the new excavation. The extension of the shell back from the diaphragm is designed to afford opportunity for putting in place the finished tunnel lining, whether of cast iron or of steel plates lined with masonry. Where the material is saturated with water it is usually necessary to use compressed air in connection with the shield. The intensity of this air pressure is determined by the depth of the tunnel below the surface of the water above it. It is evident that a greater intensity of pressure is needed for the material at the bottom of the tunnel than at the top, but as the pressure required for the bottom must in general be used, there will be danger of "blow-outs" at the top, requiring great caution in soft material. With a diameter of shield of 22 feet the pressure at the bottom of the excavation may exceed the water pressure at the top by between 9 and 10 pounds per square inch. Such inequalities tend to produce either a "blow-out" at the top of the heading or an inrush of water and soft material at the bottom. The table at the top of the following page was compiled by Mons. R. Le Gouez and shows the dimensions of the cylindrical shells of some of the principal shields used in tunneling through soft material up to the present time.



Longitudinal Section.

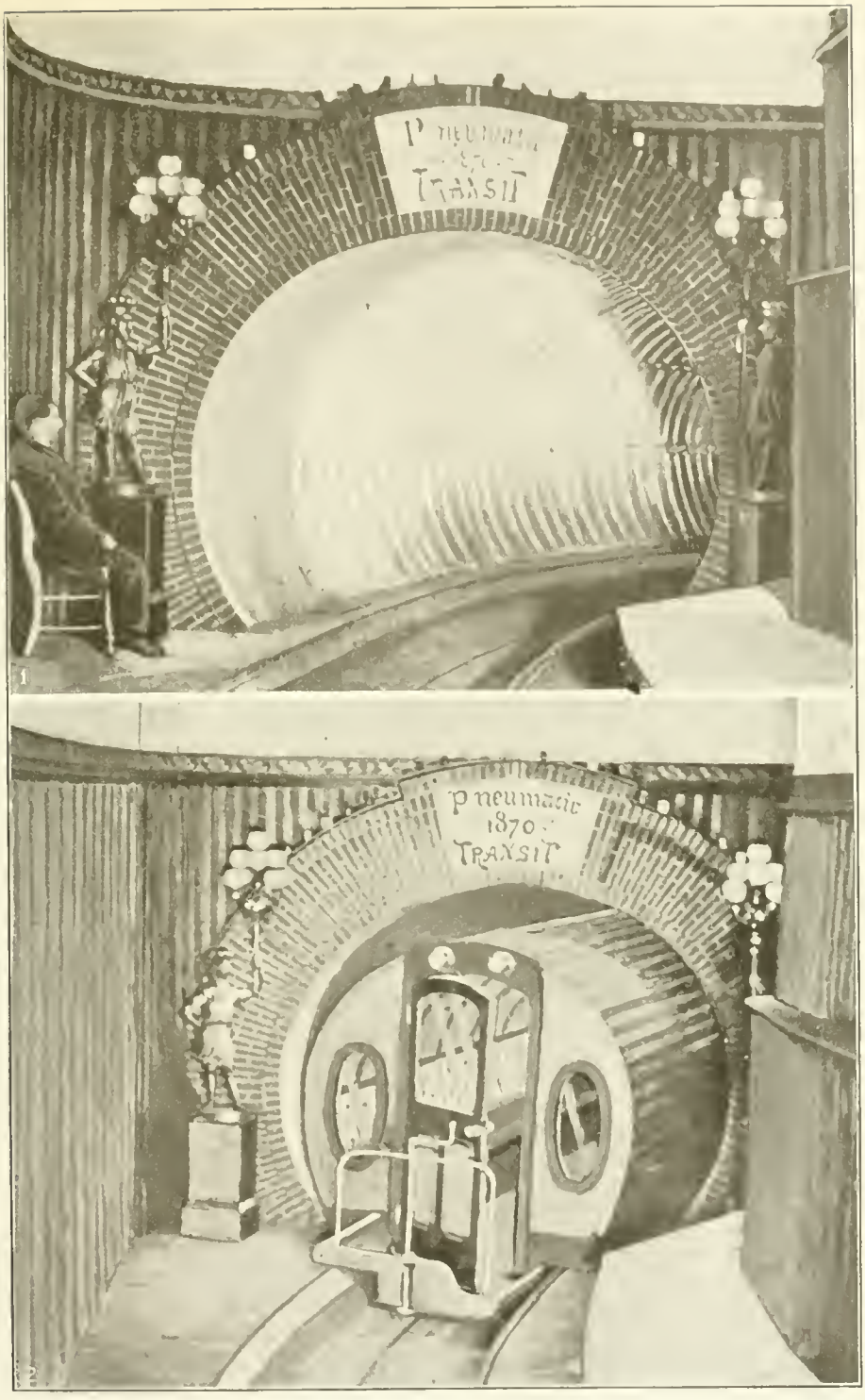


Cross Section.

FIG. 8.

The friction on the outside of the shell of the shield against the surrounding material may be over 1,000 pounds per square foot or much less than that. The amount of nominal hydraulic jack power required may be roughly taken at 4,000 to 6,000 pounds to every square foot of frictional surface on the outside of the shell of the shield.

Some of the principal later tunnels which have been or are to be constructed by the aid of shields, in addition to the early tunnels of Brunel and others, are the Sarnia tunnel under the Saint Clair River, near Detroit, Mich. (already described); the East Boston tunnel, a part of the rapid transit system of the city of Boston; the two parallel single-track electric trolley tunnels now being completed (1904) under the North River between Hoboken and New York, and the tunnels



1. Entrance to first Broadway Tunnel, N. Y. City, constructed in 1869 by Alfred E. Beach.
2. The first Broadway Tunnel Car propelled by air pressure, devised by Alfred E. Beach, and operated in 1871.

Name of Shield	Length in Feet				
	Diameter	Tail	Body	Front	Total
Concorde Siphon	6.75	2.51	2.55	1.16	6.67
Clichy Siphon	8.39	2.51	2.55	1.16	6.16
Mersey	9.97	5.61	2.98	2.98	11.58
East River	10.99	3.51	0.32	3.67	7.51
City and South London	10.99	2.65	2.82	1.01	6.49
Glasgow District	12.07	2.65	2.82	1.01	6.49
Waterloo and City	12.99	2.75	2.98	1.24	6.98
Glasgow Harbor	17.25	2.75	2.98	1.08	8.49
Hudson River	19.91	4.82	2.98	5.67	10.49
St. Clair River	21.52	4.00	2.98	11.25	15.25
Clichy Tunnel	23.7–19.8	4.00	2.98	6.88	17.22
Clichy Tunnel	23.8–19.4	7.44	11.90	4.46	23.65
Blackwall	27.00	6.98	5.90	6.59	19.48
Waterloo Station	24.86	3.34	5.51	1.14	10.00

under the North and East rivers about to be completed by the Pennsylvania Railroad Company. The following tables of double-track and single-track tunnels relate to some of the principal tunnel structures of the world and gives the quality of material penetrated, with the cost per linear foot, as brought together by Charles Prelini, C.E., in his 'Tunneling.'

DOUBLE-TRACK TUNNELS.

Name of Tunnel	Quality of Soil	Cost per lin. ft.	Method of tunneling
Mont Cenis	Granitic	$273.73	Drift
Saint Gotthard	.....	193.63	Heading
Stammerich	Granitic	157.90	English
Stalle	Broken schist	290.58	Austrian
Bothenfels	Dolomite	115.64	English
Dorremberg	Calcareous	86.08	Belgian
Stafflach	Calcareous	91.69	English
Open	Calcareous	93.19	Austrian
Wartha	Grewack	87.95	Austrian
Mertin	Grewack	87.55	German
Schloss Matrei	Clay schist	94.25	English
Trietbitte	Clay and sand	229.00	German
Canaan	Clay-slate	69.50	Wide heading
Church-Hill	Clay with shells	178.00	.....
Bergen No. 1	Trap rock	182.31	.....

SINGLE-TRACK TUNNELS.

Name of Tunnel	Quality of Soil	Cost per lin. ft.	Method of tunneling
Mont Cenis	Gneiss	$ 82.27	Heading
Stalletti	Granite and quartz	62.75	Austrian
Marein	Clay schist	64.36	English
Welsberg	Gravel	165.07	Austrian
Sancina	Clay of first variety	129.40	Belgian
Starre	Clay of second variety	191.61	Belgian
Cristina	Clay of third variety	307.42	Italian
Burk	.....	83.90	Wide heading
Brafford Ridge	.....	85.33	Wide heading
Dunbeithe	Limestone	70.47	Wide heading
Fergusson	Sandstone	37.46*	Wide heading
Port Henry	Limestone	80.00§	Wide heading
Points	Granite	72.00*	Wide heading

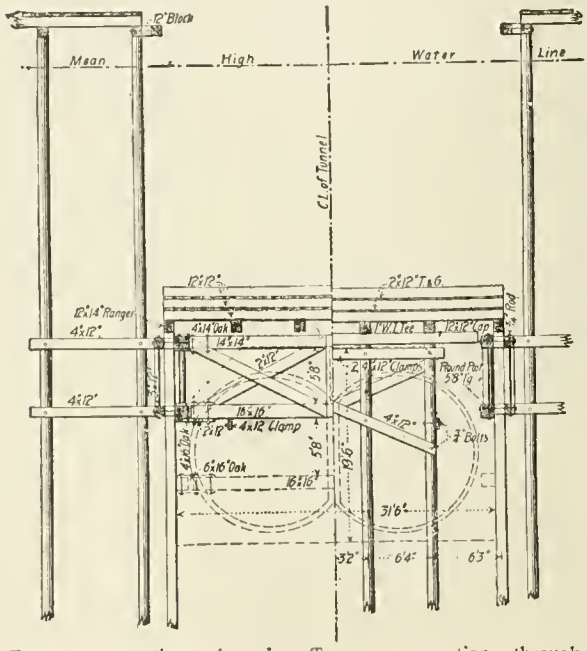
* Are unlined. § Lined with timber.

The Freezing Method of Tunneling.—This method has not yet been employed for the actual construction of tunnels, although it has been employed in sinking a few shafts in this country and a number in Europe.

In the plan proposed by Chas. Sooysmith for the tunnels under the North and East rivers for the Pennsylvania Railroad Company, the initial feature of the work is a pilot tunnel 6 or 7 feet in diameter. This pilot tunnel would be used as a refrigeration chamber for the material around it, the purpose being to freeze that material solid and then excavate it in its frozen condition. From this pilot tunnel radial pipes would project to the desired distance into the soft material around it. Compressed air might and probably would be used in all cases of soft material in driving the pilot tunnel, and if necessary in maintaining the tunnel excavation as it proceeds. These radiating pipes would be used as circulation pipes for some freezing liquid. The refrigerating plant from which the freezing liquid would be circulated and to which it would return after circulation may supply any effective freezing liquid. After the refrigerating liquid has been circulated a sufficient time through the pipes in the surrounding material the latter would be frozen to the desired extent outside of the limits of the finished tunnel so that when the excavation is made a frozen wall of material would remain until after the tunnel lining, both metal and masonry, could be put in place. It is believed by the advocates of this system of tunnel construction that it can be done more cheaply and efficiently than by any other method, although it has not been actually used in tunnel construction up to 1904.

The McBean Method of Sub-aqueous Tunneling.—This method of tunneling was designed and patented by D. D. McBean, of the contracting firm of McMullen & McBean, who constructed the Harlem River tunnel of the New York Rapid Transit Railway. The tunnel passes under the Harlem River, New York, in a northeasterly direction from 143d Street and Lenox Avenue in the borough of Manhattan, and it consists of two cylinders each 16 feet in diameter for a double-track line of railway, the centres of the cylinders being but 12 feet 6 inches apart. This arrangement makes the circles of the two cylinders overlap each other, the two openings being separated by a vertical diaphragm as shown in the illustration. These cylinders and the vertical diaphragm are of cast iron 1⅛ inches in thickness, and they are imbedded in an exterior mass of concrete so as to make one structure of the double tunnels. The depth of water over the roof is about 25 feet at high tide at the lowest part of the tunnel, the latter having a grade upward each way from the centre of the river.

The base of rail at the same place is about 45 feet below mean high water. As the depth of the water in the Harlem River at the tunnel crossing was about 26 feet at mean high tide, the range of tide being about five feet, the first step in the construction of the tunnel was to dredge the soft material from the bed of the river to a depth of 12 or 13 feet, leaving natural slopes on each side. The width of the deepest part of this dredging was a little greater than the width of the finished structure. Four lines of piling about 6 feet 4 inches apart transversely were then driven throughout the length of the tunnel location, the piles being 8 feet apart longitudinally in each row. These piles were cut off approximately at the elevation of the top of the finished tunnel structure. A pile platform of the usual character for working purposes was also constructed along either side of the tunnel location, so that an open channel a little wider than that of the finished tunnel was left between these two service platforms. A suitable framed and braced skeleton timber structure was then completed, whose outer width was exactly the width of the finished tunnel structure, and sunk to a suitable depth so as to escape the piles already driven and cut off. Corresponding longitudinal timbers were firmly bolted to the service platforms, but separated from the frame on each side by a distance of 12 inches. The frame and timbering were put so accurately in place that these two 12-inch open spaces, one on either side, constituted exact guides for two lines of heavy sheeting 12 inches thick, which were next driven in place. Each of these lines of heavy sheeting was formed of units composed of three 12-inch by 12-inch sticks firmly bolted together, making one piece 36 inches by 12 inches. Three-inch by 4-inch pine strips were spiked to each of the 12-inch faces of these sheet piling units so that when driven in place a tongued and grooved result was produced. This line of heavy sheet piling on either side was firmly driven to refusal at all points by pile drivers supported on the service platforms. After driving the two lines of sheeting in place they were accurately cut off by a circular saw, on a shaft held between the leads of a pile driver, at an elevation a little above the top of the finished tunnel. On the top of this accurately cut off line of heavy sheeting was sunk a timber roof consisting of three courses of 12-inch by 12-inch timbers separated by two longitudinal courses of 2-inch plank. The under side of this timber roof carried four longitudinal lines of 12-inch by 14-inch timbers which, when the roof was sunk, rested upon the tops of the four lines of piles already described. This arrangement of the heavy timber roof and the two side lines of sheeting forms an enclosed chamber into which compressed air was forced so that laborers entered it, made the desired excavation and completed the tunnel structure. As fast as the excavation in this chamber was finished the piles were again cut off at an elevation a little greater than the bottom of the concrete mass forming the floor of the tunnel, so that the concrete surrounded the tops of the piles to some extent. As the concrete tunnel structure with the cast-iron lining was thus completed it rested both upon the bottom of the excavation and on the piles, thus affording a firm and strong support under moving traffic, however soft the material might be. The joint between the timber roof and the two side lines of sheeting was rendered tight by a flat strip of steel in a vertical longitudinal position forced into the timber as the roof settled down upon it. This joint, as indeed all the points of the work, proved to be practically water-tight, so that the construction of the tunnel in the chamber was rapidly prosecuted without any trouble from entering water. The pressure of air used in the chamber was only that due to the head of water, that is, about 25 feet, above the under side of the timber roof. With this pressure the water was pumped out of the chamber enclosed at each end by a suitable but temporary bulkhead, and the remaining work was accomplished as if in an open cut. Thus, although the bottom of the tunnel was about 47 feet below mean high water, the air pressure in the chamber was that due only to about 25 feet head of water. The illustration, made from working drawings, shows clearly this method of building tunnels, which is obviously practicable to any depth at which it is feasible for laborers to work in compressed air. Instead of using a temporary timber roof, which was removed after the tunnel was completed for the first half of the work, the upper half of the completed tunnel was used for the roof sunk on the two lines of sheeting cut off at a correspondingly lower elevation for the last



Transverse section through double-tube tunnel, between piles.

Transverse section through double-tube tunnel, showing piles.

FIG. 9.

portion (about one half) of the tunnel. Although the Harlem River tunnel was constructed in soft material, the method is equally well adapted to construction in hard material or even in rock. It is the latest distinct advance in sub-aqueous tunneling successfully accomplished. See also SUBWAYS.

W. H. BURR,
Professor of Civil Engineering, Columbia University.

Tunnels, Great Modern Mountain. The completion of the boring of the Simplon tunnel on 24 Feb. 1905, thus assuring of its being opened to travel during the latter part of the year, marks the culmination of one of the greatest events in civil engineering during the last decade, and the successful termination of the greatest tunnel boring enterprise of any age, ancient or modern.

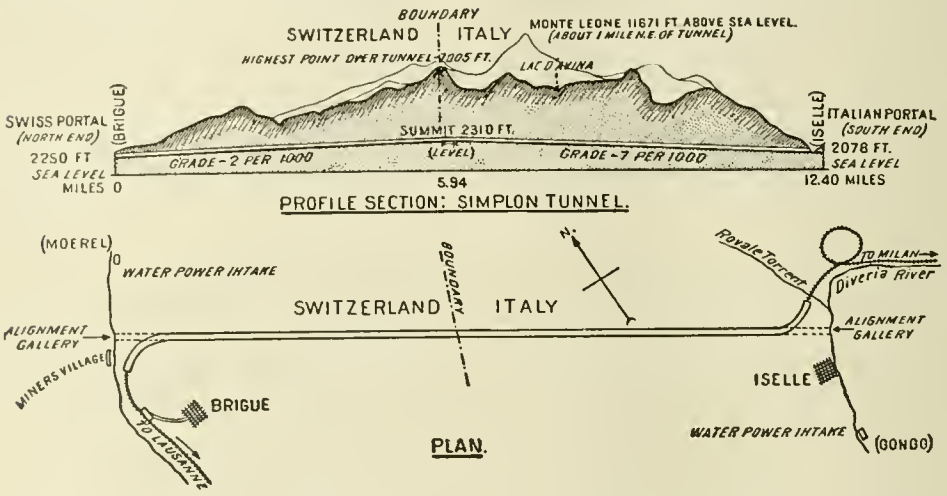
At the present time, four great tunnels pierce the great Alpine barrier between Northern and Southern Europe. The Mont Cenis and the Saint Gotthard connect France and Italy; the Arlberg places Austria in communication with Italy, while the Simplon forms a direct connection between Italy and Switzerland, bringing Geneva and French Switzerland into closer communication with Milan and the Adriatic railways. It also shortens the distance from Calais to Milan by 95 miles, as compared to the Mount Cenis route, and by 80 miles over the route passing through the Saint Gotthard.

The feasibility of a transalpine tunnel was contemplated about the middle of the 19th century, and work was begun on the Mount Cenis tunnel in 1857, at a point near Modane in France, from which it passes under the elevation, Col de Frejus, about 18 miles west of Mont Cenis, and emerges into Italian territory at a point near Bardonecchia, 24 miles from Susa. The exact length of the tunnel between portals is 7.6016 miles, but as the railway, instead of entering the tunnel at the portals, joins it through special curved sections at each end, the total length of the borings amounts to about 8 miles. It was bored simultaneously from both ends on a rising gradient, with its summit at the middle point. The grade from Modane is about 1 in 2,000. The rock formation traversed as the boring advanced southward from Modane was characterized by carbonaceous schist 1.3027, quartz 0.2414, limestone 0.2210, and calcareous schist 2.0357 miles; while the entire distance traversed from the Bardonecchia end to the summit amounting to 3.800 miles, was through calcareous schist. The altitude of the tunnel is about 4,248 feet above sea-level, and 5,428 feet below the crest of the mountain. At the Modane end the tunnel is 25 feet 3½ inches wide at the bottom, 26 feet 2¾ inches at the point of maximum breadth; semicircular in form, and 24 feet 7½ inches in height. At the Bardonecchia portal, an elliptical arch is introduced to resist the greater strain caused by the different inclination of the strata, and the height is 11¾ inches greater than that of the Modane section. The side walls are 8 feet 6 inches in thickness throughout the entire length of the tunnel, and with the exception of 300 yards on the north side, are lined with brick and stone, while the side paths are paved with flagstones 20 inches in width. During the first three years, the operations consisted of hand labor exclusively, but in 1861 and 1862, power drills were installed at the Bardonecchia and Modane ends, respectively. The drills employed were designed by Sommeiller, the chief engineer. They were of the percussion type, the operative power being compressed air. Gas factories and machine shops were installed at each end. During the boring process, many springs were tapped, the water from which found an outlet through the tunnel. This water was finally utilized to furnish the power for the air compressors operating the drills — the Italian engineer profiting by the suggestion of the invention by Bartlett in 1855, of a rock drill operated by air compressed by a steam engine. The air compressing apparatus was installed at the Italian end, the compression approximating six atmospheres, derived from the hydraulic pressure from mountain streams and the water from the tapped springs. The same apparatus supplied fresh air at the rate of 2,000 cubic feet per minute, while the ventilation was accomplished partly by the atmospheric drills, and partly by special ventilating pipes 8 inches in diameter, the blowers and exhausting bells being operated by powerful turbines. Gun-powder was exclusively used in the blasting operations, the charges being fired by a magneto-electric apparatus in front of a movable bulkhead, which was advanced as the work progressed, the detritus being subsequently removed by hand, by gangs of men 900 feet apart, working on scaffolds at various heights. The hauling was accomplished by horses and small trucks. The credit of the work belongs to the three Italian engineers, Sommeiller, Grandis, and Grattoni, whose genius surmounted the many obstacles which daily confronted its advance. The boring of the tunnel was finished in 1870, and it was opened to traffic in 1872, equipped with a double track railway and cost $1,100 per linear yard, a total expenditure of $15,000,000, and required 13½ years for the accomplishment of an engineering task, which was the greatest in its time. The entire undertaking was financed by the Sardinian Government. It is an example of tunnel construction by the drift method.

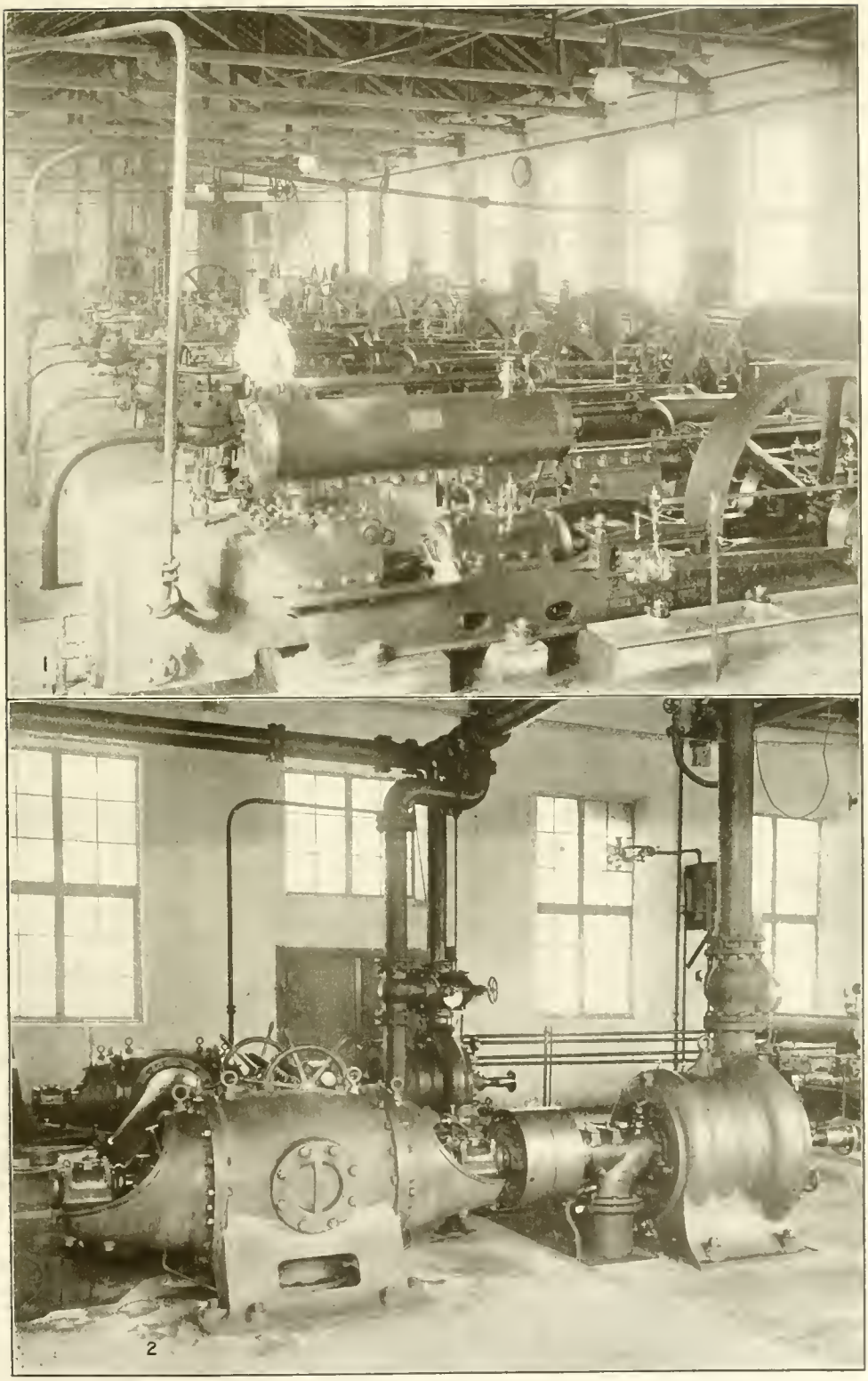
Immediately following the opening of the "Mt. Cenis" for travel in 1872, a work of much greater magnitude was undertaken not only to make another connection between France and Italy, but to connect the North Sea ports with those of the Mediterranean; those of Belgium, Holland, and Germany, with Genoa; and the Valley of the Rhine with that of the Po. The enterprise was too great for private industry or capital, therefore, in 1871 Italy, Germany, and Switzerland voted large subsidies for the construction of a railroad to run from Lucerne, Switzerland, to Lake Maggiore, Italy, a distance of 108 miles, 21 per cent or about 120,000 feet of which was to be tunneled through mountains of granite. It was estimated that the work could be accomplished at a cost of 187,000,000 francs. An international treaty was signed; a stock company was organized with 34,000,000 francs of stock in 20 shares, and 68,000,000 francs of mortgage bonds. Italy gave 45,000,000 francs, and Germany and Switzerland each 20,000,000 francs. This estimate, however, was found to be too low by 102,000,000 francs, and caused a great many unnecessary delays in the work, which was finally completed at a cost of 289,000,000 francs ($57,800,000), of which $11,500,000 was expended on the Saint Gotthard

tunnel alone, the location for which in spite of many undesirable topographical conditions was selected at the most central point of the Alpine range, on account of the directness of the route thus obtained. The northern portal is situated near the little village of Goeschenen in the canton of Uri, Switzerland, from which the axis of the tunnel passes through the range under the lofty peak known as Col de St. Gotthard, and emerges from its southern portal near Airolo in the canton of Tessin, Italy, after traversing a direct distance of 9¼ miles, and forms a part of the railway from Lucerne to Chiasso.

Unlike the case of its predecessor, the Mont Cenis, the tracing of its axis was beset by a great many difficulties, due to adverse topographical conditions. The axis of the Mont Cenis was traced under the mountains by means of three astronomical observatories, one being established at a high elevation and equipped with a telescope that revolved in the vertical plane passing through the axis of the tunnel. From this station the positions of the other two observatories were determined toward the entrances, their telescopes placed in the same vertical plane, and the direction of the axis supplied to them whenever necessary. The direction of the Saint Gotthard was determined by careful triangulation; the fine topographic maps of Switzerland forming an important and valuable adjunct to the operations. Owing to the great elevation at which the tunnel was driven, that of the north and south portals being respectively 3,639 feet, and 3,757 feet above sea-level, seven sets of helical or spiral tunnels, four on the Italian, between Giornico and Fiesso, and three on the Swiss side, were constructed to bring the railway up to the great elevations of the portals. This system, designed by Hellwag, the engineer-in-chief, comprised a series of one hundred tunnels in all, some of which are 6,000 feet or more in length, making the total distance tunneled slightly less than 23 miles. Under these conditions, the trains enter the foot of the mountains and by winding about through the spirals within its bowels, emerge along its sides a couple of hundred feet higher up at each lift until the entrance to the main tunnel is reached. The travelers are thus afforded successive views of the magnificent Alpine scenery from various altitudes, passing within a few hundred yards of Rutli, Bürglen, Altdorf and other spots made famous by William Tell, and through the intricacies of the rugged Axenstrasse. Salient facts relative to the construction of this tremendous piece of engineering may be briefly stated as follows: The work was prosecuted under the Belgian system, main heading; the rock drills being operated and ventilation accomplished by water power exclusively. At the Swiss end, 1,220 horse-power was derived from the Reuss River by means of four horizontal impulse turbines, and at the Italian end, 1,220 horse-power, from the combined heads of the Tessin and Tremola rivers, by means of six turbines of the same type. These turbines working in pairs, drove groups of Colladon air compressors, which supplied 1,000 cubic yards of air per hour at a compression of seven to eight atmospheres, equal to 100 horse-power, delivered at the drills, which, when exhausted, equalled 8,000 cubic yards of fresh air per hour. Dynamite was exclusively used in the blasting operations, being considered cheaper and safer than nitro-glycerine. At first the arrangements for ventilation were very inadequate, and combined with a lack of proper sanitary and hygienic regulations, resulted in a great loss of life. The application of the injector system of ventilation, invented by Signor Saccardo, engineer of Bologna, rectified these conditions materially. The force of laborers numbered 3,500, all Italians, while the officers were Swiss and Germans. The men were paid from 3 to 6 francs per day of 8 hours work, and had to board themselves. Under these circumstances the poor food with which they supplied themselves, contributed greatly toward the enormous death rate. Favre (Swiss) was the head of the firm of contractors. The cross section dimensions of the boring is similar to that of the Mont Cenis, and is lined throughout with masonry 18 to 20 inches in thickness. It is equipped with a double-track railway, and required 9½ years of labor for its construction, which was commenced in 1872 and completed in 1882.



The third great Alpine tunnel, the "Arlberg,"



1. AIR COMPRESSORS AT BRIG, THE SWISS END OF THE SIMPLON TUNNEL
2. TURBINES AND PUMPS FOR COOLING WATER IN NORTHERN HEADINGS OF TUNNEL

forms a part of the Austrian railway between Innsbruck and Bludenz in Tyrol, which connects westward with the Swiss railroads, and southward with those of Italy. It penetrates the Alpine water-shed between the Rhine and the Danube, from St. Anton to Langen, a distance of 10.25 kilometers, about 6⅓ miles, its axis passing 1,594 feet under Arlberg Pass. The eastern and western portals are respectively 4,277 feet and 3,985 feet above sea-level, with the summit at an elevation of 4,301 feet. Its construction was commenced in 1880 and completed in 1883, at a cost of $7,500,000. Passenger trains pass through the tunnel in about twenty-five minutes.

Many schemes to connect Switzerland and Italy by a railway near the Simplon Pass had been in contemplation for several years. In 1881 the Jura-Simplon Railway advanced the scheme of piercing the Alpine barrier by a tunnel, which entering the base of Monte Leone at a short distance above Brigue, situated on the Switzerland side, on the left bank of the Rhone, and passing under the lofty mountain range, would emerge at Iselle on the Italian side, the distance to be traversed being somewhat over 12 miles. Since the days of the Roman Empire, the Simplon Pass has been the trade route between Milan and the flourishing cities of the Valley of the Rhone. For more than 2,300 years it was the great highway of trade and travel between Southern and Northwestern Europe. Over it, Hannibal led the conquering armies of Carthage, and, later, Cæsar his legions, when he laid the foundations of the Roman Empire. In modern times the Jura-Simplon Railway has run its trains along the same route, although laboring under the almost prohibitory difficulties of excessive grades, and the long distance compelled by the ruggedness of the rock formation on the Swiss side of the frontier. The Swiss and Italian governments considered the scheme proposed by the Jura-Simplon Railway Company favorably and undertook its financing jointly. The Swiss government entrusted the work of construction to the Baugesellschaft fuer Simplon-tunnel, Brandt Brandau & Co., extending to it a credit of $13,000,000, stipulating that the entire work should be completed in 5½ years, the limiting date being stated as 21 May 1904. For each day that the work was finished prior to that date, the company was to receive a premium of $1,000, and for each day of delay subsequent to that date, it was to be fined a similar amount. The price named, however, was greatly exceeded, the actual cost finally amounting to $15,700,000; the additional payment, and the extension of the time for completion being agreed to by the governments interested, on national grounds, as well as in due recognition of the many unexpected difficulties that confronted the contractors and caused unavoidable delays. For example, although the advancement of the tunnel averaged between 500 and 700 feet per month, an advance of only 50 feet was made during the first three months of 1902, the work being retarded by the tapping of many springs, and the occurrence of numerous rock-slips.

The first blast in the work of boring was fired 21 Nov. 1898, the operations being carried on simultaneously at both the Swiss and Italian ends. In order to avoid the excessive freight rates compelled by the expensive operation of the traffic over the inclines of the Saint Gotthard, as well as for the purpose of making it an express route operating fast-train service, the altitude of the tunnel was kept as low as possible, although it might have been driven at a much higher level with an enormous saving in the cost. The Swiss end has an altitude of 2,250 feet, and the Italian end 2,076 feet above sea-level, while the summit of the tunnel, where the ascending gradients from each end meet, has an altitude of 2,310 feet.

This tunnel, unlike the other transalpine borings, which are single passages equipped with double tracks, consists of two parallel tubes or twin passages, each 16¼ feet wide, separated by a distance of 55.7 feet between their axes, each passage being equipped with a single track, thus permitting of travel in both directions at the same time. It is straight throughout its entire length with the exception of a short curve at each extremity, so that the new railway running from Brigue and gently ascending the Valley of the Rhone for a distance of 1¼ mile, enters the tunnel on a right curve of 1,050 feet radius. The straight portion of the tunnel commences at a distance of about 460 feet from the entrance, extends a distance of 12¼ miles, at an obtuse angle with the Rhone Valley in Switzerland, and the Val Vedro in Italy, and emerges on a left curve of 1,311 feet radius, above the banks of the Diveria River, on the Italian side. It has rising gradients of 2 per 1,000 from the Swiss side, and 7 per 1,000 from the Italian entrance, the summit of the tunnel or the meeting point of the gradients being at a distance of 5,944 miles from Brigue, at an altitude of about 2,310 feet above the level of the sea, and about 7,000 feet below the crest of the mountain between the Furggenbaumhorn and the Wasenhorn. The two passages are connected by transverse galleries or cross-headings at intervals of 660 feet, thus facilitating ventilation, and problems of transportation. At the summit the transverse gallery is excavated to double width, and affords room for the central station located at that point.

The working force numbered 1,000 men, divided into three shifts on the eight hour basis, so that the work was carried on continuously day and night during the entire period of over six years. These laborers were all Italians, the Swiss having no adaptability to the work of blasting rocks and removing debris, thousands of feet below the snow-capped mountain ranges, or the verdant hills upon which they tended their herds and crops. This small army of workmen were comfortably located in well-arranged quarters which were erected across the river near the Swiss portal, and every necessary precaution was taken to protect their health and keep them in a fitting condition to prosecute their labors. The many fatalities consequent to a lack of these precautions in the construction of the Saint Gotthard afforded an example by which the Simplon management profited greatly. At the Swiss end they established a fine hospital with facilities for treating emergency and contagious cases. Sanitary and hygienic regulations were strictly enforced. When a shift of laborers were relieved and came out of the hot workings in the tunnel, each man was required to take a bath at once, before being exposed to the keen Alpine atmosphere, and he was required to hang his damp

working clothes in a drying room, and put on another suit while he was off work. As the Simplon boring was executed at a depth ranging from 5,000 to 7,000 feet below the surface of the mountains, about 50 per cent deeper than had ever been required previously, the engineers were compelled to devise means to ameliorate the resulting conditions of torridity, in which the temperature frequently rose to 110° F. These conditions were modified by pumping cold water from the outside into the boring through pipes pierced with small holes, so that the water fell upon the laborers like a fine rain or drizzle, and through this liquid veil the fresh air was forced and cooled to a bearable temperature. The general refrigeration was effected by means of 34,118 feet of 9.96 inch piping from each end, connected to four refrigerating appliances of 71 heads and 11 jet sprays placed at intervals along the boring, so that the spray would bathe all the sides of the headings in the neighborhood of rock heated to a high temperature by infiltration from hot springs, the waters of which were of a parboiling temperature and often exceeded 112° F. The plan of carrying away the hot water to some point where its effect would not cause the same local inconvenience was uniformly pursued, but only partially prevented the heating of the air, although the greatest care was taken to insulate the pipes both from hot and cold radiations. Ventilation was accomplished with the aid of the auxiliary tunnel, No. 1. It is to be understood that of the twin passages, the one designated as No. 2 was completed first, that is, enlarged from the heading to its ultimate dimensions, passage No. 1, at first being carried on with much smaller dimensions, and forming an important adjunct in the system of ventilation. The compressed air for this purpose and for operating the compressed air locomotives was carried through tunnel No. 1, to the headings through pipes varying from 1.18 to 1.97 inches in diameter; air valves on the main at various points enabling the recharging of the locomotives. When the heading face was some distance in advance of one of the transverse galleries, cool air was supplied to a nearby point through a light sheet-iron pipe carried immediately below the roof of the heading. At intervals a connection was formed between the hydraulic pressure main running along the floor of the heading, so that a jet of air was forced into the overhead pipe under a pressure of about 78 atmospheres, inducing a strong current in the pipe which was conducted right up to the face. The water was collected in and drained off a number of siphons placed at intervals along the air main. During the last two years of the work compressed air locomotives were exclusively used at the Swiss end as the use of horses for switching the spoil trucks at the headings was made impossible by the heat of the tunnel. An important feature of the entire work was the fact that no possible advantage that could be derived from transported hydraulic force was neglected. The water discharged from the tunnel from tapped hot springs and infiltrations amounting to 50 or 60 gallons per second was utilized to operate the ventilator turbines, as also the return water pumped into the tunnel for power to drive the rotary drills, and for purpose of refrigeration, amounting to 26 gallons per second.

The rock boring work was accomplished with the Brandt hydraulic perforator, a machine consisting of a hollow steel stem, 2¾ inch diameter, carrying on its end three tempered cutting points. It was operated by a hydraulic engine with a pump pressure ranging from 80 to 120 atmospheres, representing an available force of 22,000 to 26,000 pounds. During operation, water was constantly forced through the hollow stem, and while washing away the debris, tended to keep the teeth cool. The teeth, biting into the rock wore it away at the rate of about ⅓ an inch per revolution, the number of revolutions varying from 4 to 8 per minute according to the hardness of the rock. From 10 to 12 machines were in operation at each end of the tunnel from the start. When the drills had penetrated to the depth of about five feet, they were withdrawn, the dynamite was inserted and fired and the spoil cleared away.

Although the wear on the teeth of the drills was so excessive that they had to be replaced frequently, their service was so effective and so superior to that of the diamond drills, that they will probably supersede the latter universally on work of this character hereafter.

Perhaps the greatest of all of the difficulties encountered in the prosecution of this work was the influxes of hot water, first on the Swiss and later on the Italian side. Professor Schardt, the official geologist, estimated that the tunnel discharged one billion cubic feet of water during its construction. At times the boiling springs tapped converted the boring into a veritable canal, forcing a suspension of operations for months at a time, until the water was gotten under control, pumped out, and the walls of the tunnel sufficiently cooled by sprays of ice water, to allow the men to resume work. Even then they had to be sprinkled constantly with ice water to enable them to withstand the deadly temperatures. These conditions forced the abandonment of the operations on the Swiss side at a point about six miles distant from the entrance, the necessity for the suspension of operations being materially augmented by a landslide which occurred at Moerel, a point on the Rhone, a short distance above the intake of head-water which supplied the hydraulic force for the power station at Brigue. The work was then carried on from the Italian end, and advanced regularly at the rate of about 16½ feet per day, until 6 Sept. 1904, when a gigantic boiling spring was tapped which discharged into the tunnel a stream of water with a temperature of 113° F., at the rate of 1,600 gallons per minute. The rock temperature was forced up to 108° F., and the work had to be stopped until a transverse gallery could be constructed to join the two southern passages so as to allow the hot water to flow out of the main passage through a lateral canal along its walls. The temperature was cooled by jets of ice cold water, and after a delay of three months during which the work of enlargement was accomplished, the heading was pushed forward resulting in a junction of the northern and southern tunnels 24 Feb. 1905, allowing the immense volume of water which had accumulated in the headings of the abandoned north tunnels to flow down through the main south tunnel into the Diveria River.

The machinery installed at both ends of the tunnel were mainly of European manufacture.

It consisted of four-stage high-lift centrifugal pumps and hydraulic turbines at the power stations, centrifugal pumps driven by Pelton wheels in the swamped portions of the tunnels; duplicate 12¼ foot ventilating fans, which will continue to serve all the requirements of the tunnel under operative conditions, driven by two 200 horse-power hydraulic turbines. High-pressure plunger pumps in connection with the hydraulic accumulators, each pair of pumps being driven by a Pelton wheel, supplied cold water to sixteen Brandt hydraulic borers working at both ends of the tunnel, four at each heading face. The high-lift refrigerating centrifugal pumps were run in series at 950 revolutions per minute, under a pressure of 370 pounds per square inch, and supplied water to the refrigerating plant at the rate of 18.21 gallons per second. The refrigerating conduit also furnished power for four ejector pumps and six portable fountain heads located in the traversing galleries. In the beginning steam locomotives were employed for hauling, and steam engines were kept in reserve to be used in case of the failure of the water power; but as the work advanced, compressed air locomotives were used exclusively at both ends of the borings. The air compressors had a capacity of two and three cubic meters of free air per minute, and compressed air into a reservoir of the tubular battery type. The machinery installations at both ends of the tunnel were identical.

A very clear idea of the difference in the amount of time and labor consumed in the boring of ancient and modern tunnels may be obtained by comparing the Roman tunnel bored for the purpose of draining Lake Fucino, with the Simplon. The former, begun in the reign of Julius Cæsar, was completed during that of Claudius 52 A.D. It was 3½ miles long, and passed under the Palatine at a maximum depth of 400 feet. Its construction involved the sinking of 40 vertical shafts and many inclined galleries, requiring the labor of 30,000 men during a period of 11 years. It was the most celebrated work of its kind at that time, and still remains in an almost perfect state of preservation.

On the other hand, the Simplon tunnel with its twin passages 12¼ miles in length, representing 24½ miles of boring, at a depth often exceeding 1¼ miles below the surface, required the labor of 1,000 men during a period of about 6½ years. The Fucino tunnel has a normal cross section 10 feet high by 6 feet wide; with the appliances used in the work of the "Simplon" it could have been easily bored in six months.

The only American tunnel comparable to the transalpine borings already described is the Hoosac tunnel on the line of the Fitchburg Railroad, between Troy, N. Y., and Greenfield, Mass. It is driven through a southern spur of the Green Mountain range, known as Hoosac Mountain, and is 25,037 feet (4¾) miles in length. Its construction was commenced in 1855 and completed in 1873, the masonry work requiring several additional years. During this period the work was suspended many times on account of a lack of funds, and the natural obstacles encountered. Where the rock is solid, it is 20 feet high and 24 feet wide, but wherever arching was necessary these dimensions are somewhat greater. The work was carried on by four headings, one from each end, and two from an intermediate shaft 1,028 feet in depth; modern tunnel boring methods, involving the use of electricity, nitro-glycerine, air compressors, and power rock drills, and marking their first introduction in America. It has an ascending gradient of 26 4-10 to the mile, is equipped with a double railway track, and cost a little less than $11,000,000.

The lengths of some of the other important mountain tunnels in various parts of the world are as follows: the "Giovi" on the Genoa-Ronco Railway, 8,260 meters (about 5 1-6 miles); the "Marianopoli," on the railway from Catania to Palermo, in Sicily, 6,840 meters (about 4¼ miles); the "Sutro" in Nevada, 6,000 meters (about 3¾ miles); the "Standridge," between London and Birmingham, 4,970 meters (a little more than 3 miles); the "Nerthe," between Marseilles and Avignon, 4,620 meters (a little more than 2¾ miles); the "Pracchia Tunnel," on the main railway line between Florence and Bologna, through the Apennines, comprising 52 tunnels with heavy gradients — 25 per 1,000 throughout, the several tunnels varying in length from 3,000, 6,000 to 9,000 feet, characterized by very poor ventilation, which was finally improved by the Saccardo system of ventilation, which was here applied practically for the first time. The "Bilbo" in Italy, 4,240 meters (a little over 2½ miles); the "Kaiser Wilhelm," on the Moselle railway, near Kochem, 4,220 meters; it is the longest tunnel in Germany. The "Blaisy," on the railway from Paris to Lyons, 4,100 meters (2½ miles); the "Stampede," on the Northern Pacific Railway, 9,850 feet, and the "Cascade," on the Great Northern Railroad, 13,413 feet in length, through the Cascade Mountains in the State of Washington. The construction of the former was begun in 1886, and completed in 1888; that of the latter covering the period between 1897 and 1900, the cost of each being about $1,250,000. Both of these tunnels pierce the mountains at a considerable elevation, about 3,000 feet above sea-level, but are surpassed in this particular, and the technical difficulties of construction encountered, by those of the transandean railways, the most notable of which was opened in 1892, on the Peruvian Central Railway, running from Callao to the Pacific Ocean, thence by way of Lima to Oroya on the eastern slope of the Cordilleras. This line after passing the station Sureo on the Chalappa Viaduct at an elevation of 6,650 feet, overcomes the great topographical difficulties of the Matacana Valley and passes through the tunnel, 3,596 feet long, at a height of 15,781 feet above sea-level — an elevation equal to that of Mont Blanc, the highest peak of the Alps — in a region of perpetual snow, 104 miles from Callao. Another one, 15,880 feet in length and forming a part of the railway between Buenos Ayres, Argentina, and Santiago, Chile, pierces the Andean range at an elevation of 10,500 feet above the sea.

The most notable of the many other examples of mountain tunnels are the "Stone Mountain Tunnel," at Gibraltar, a series of galleries 3 miles long, pierced for cannon at intervals of 12 yards and having guns of large calibre already mounted in 1,000 of these embrasures. The "Joseph II. Mining Adit," forming the main efflux gallery of the metal and sulphur mines at Schemnitz, Hungary. It was com-

menced in 1782, the time required for construction being estimated at 30 years, and the cost at 1,215,000 florins. The progress of the work, however, suffered a great many delays and it was not completed until 1878, the total expenditure amounting to 4,599,000 florins. It is 9 feet 10 inches high, 5 feet 2 inches wide, and is the longest mining tunnel in the world, having a length of 10¼ miles. The "Kojak," forming a part of the Northwestern State Railway of India, about 2½ miles long, and completed in 1891. The "Tequixquiac," a boring 14 feet in diameter, driven through sandstone for the purpose of draining the Valley of Mexico. It is 6 miles long and cost $6,760,000. The drainage works designed to improve the sanitary condition of the City of Mexico and prevent the inundation of its streets, for long periods at a time, by the overflow from Lake Texcoco, and the consequent loss of thousands of lives, were begun during the latter part of the 16th century. Up to 1789, the work was of an intermittent character, cost many thousands of lives, and many millions of dollars. From 1789 to 1830, the effort was more sustained and systematic, but, although $8,000,000 had been expended, and the city protected from the inundations, its position in the bottom of a basin without natural drainage, with the artificial drainage canal inadequate in depth owing to its being controlled by the level of the lake which was but slightly lower than that of the city, continued to keep it subject to virulent epidemics of malaria. The new works, gigantic in character, and ranking with the greatest of modern engineering accomplishments, were begun in 1885, and completed in 1900, with a total expenditure of $20,000,000. These works consist of a complete sewerage system within the city; a system of sewers to control the overflow of the entire valley; a canal 43 miles long, connected with the sewerage system, at the Saint Lazaro gates, by which the sewage of the city, its waste waters, and the waters of the valley are conducted to the tunnel, thence to a river emptying into the Gulf of Mexico. The "Graveholz," on the Bergen Railway in Norway, about 3⅓ miles in length, and the Yanagase Zama forming a part of the Tsuruga-Nagahama Railway in Japan. This road is a 27-mile branch running from the north coast of Japan to a junction with the main line at Nagahama. The greater portion of the line runs over a flat country, with easy gradients and curves, to Yanegase, 9 miles from the coast of Tsuruga, where it encounters the mountain range extending from the coast of Yechezan on the north, to Lake Biwa on the south. The tunnel pierces the range at the summit level of the line, 751 feet above the sea, and 788 feet below the crest of the mountains. It runs in an east and west direction, the greater part of its length of 4,436 feet being straight with a short curve of 990 feet radius, introduced at the western end, from which the line descends a narrow gorge between the mountain spurs, on a heavy embankment for a distance of 3 miles, and passing through a short tunnel, emerges on a plain over which it runs on an easy grade to its terminal on the breakwater in Tsuruga Bay. It is 15½ feet high, 10 feet wide at the bottom and 14 feet wide at the springing line of the semicircular brick arch of 7 feet radius, forming its top. A drain 1 foot 6 inches wide and 2 feet deep runs along the centre of the bottom, with a uniform gradient of 1 in 40. It was driven from both ends — the work at the western end was begun in 1880 and that at the eastern in 1883. Ingersoll rock drills were employed, but with little success, their powerful percussion working adversely through the rock formation which was interspersed with veins of clay. The working force was divided into 3 shifts of 8 hours, except when operating through very wet ground, when the hours of labor were lessened by dividing them into 4 shifts of 6 hours. This arrangement was made still more imperative by the bad ventilation after the headings had advanced 300 feet, although every precaution had evidently been taken to provide against such a contingency. These conditions were subsequently somewhat improved by the introduction of ventilating blowers and air compressors driven by turbines. At first, powder was used for blasting purposes, dynamite being substituted soon afterward. The timbering consisted of green matsu. During the early stage of the work it was attacked by insects which gave much trouble; their ravages, however, were completely checked by infusions of carbolic acid. The material used in the lining amounted to 2,706,640 bricks, 103,000 cubic feet of stone, 90,288 of sand, 2,522 of lime, and 705 tons of cement. It was completed in the spring of 1884 and cost 449,457 yen (about $337,000), an average of $230 per linear yard.

Reverting to the "Simplon Tunnel," in the construction of which many great technical difficulties were overcome by the application of modern machinery and a high order of engineering thought, the demonstration of the feasibility of driving mountain tunnels at low levels is, perhaps, the most important of all the new facts established by the operations, and will become the general practice in works of the kind in the future.

Another tunnel for which plans have also been made, will traverse the Ligurian Apennines, connecting Genoa and Milan, the industrial capital of Italy. It will be 13 miles long, and lying at a comparatively short distance below the surface, will give easier gradients and thus facilitate transportation. Of many other mountain tunnels under contemplation, or partially constructed at the present time, and which will become completed engineering projects during the next decade, special mention may be made of the tunnel on the Atlantic and Pacific Railway between Denver, Col., and Salt Lake City, Utah. Beginning at a point 9 miles southwest of Georgetown, 60 miles west of Denver, it pierces the backbone of the Rocky Mountains, and passing under Gray's Peak, emerges on the western slope of the Continental divide, at a point near Decatur, Col., a distance of about 12 miles, and when completed will shorten the distance between Denver and Salt Lake City by 400 miles. Another similar tunnel in Colorado, about 20 miles long, on which work was commenced in 1897, will pass under Pike's Peak.

Bibliography.— For further detailed information, consult: Drinker, 'Tunneling' (New York, 1874); Legoux, 'De l'emploi du bouclier dans la Construction des souterraines' (Paris, 1897); La Dame, 'Les grands tunnels des Alpes et du Jura' (Paris, 1889); Danino, 'Gallerie della traversata dell' Appenino, nella linea Foglio' (Rome and Naples, 1875); Prelini, 'Tun-

neling' (New York, 1901); Simms, 'Practical Tunneling' (New York, 1896); also the following works describing tunnels: Von Rosenburg, 'The Vorburg Tunnel' (New York, 1887); Walker, 'The Severn Tunnel' (London, 1888); Burr, 'Tunneling Under the Hudson River' (New York, 1885); Sutro, 'The Sutro Tunnel' (New York, 1887).

WILLIAM MOREY, JR., C. E.,
Consulting Engineer, New York.

Tun'ny, a large, brilliant and valuable fish of the mackerel family (*Thunnus thynnus*), which occurs in shoals in almost all the seas of the warmer and temperate parts of Europe, Asia, Africa, and America, but is not equally common in every season or in all parts of the seas which it frequents. Immense numbers enter the Mediterranean by the Straits of Gibraltar in May and June, and immediately divide, one part following the shores of Europe and the other those of Africa, in search of a place to deposit their spawn. The fishery is one of the most important in the Mediterranean, especially about Sardinia. At the approach of winter it retires to deep water. It often, besides, wanders widely, and has acquired many local names, as albicon, horse-mackerel, etc. It is not uncommon in the Pacific off Santa Catalina, where it is known as the tuna, and is angled for from small launches that run out to sea. Large examples, and they sometimes attain a weight of 1,500 pounds, fight so determinedly for freedom that many hours are often consumed in mastering them. Although readily sold when captured and much relished there is no regular fishery for the tunny in the United States.

Tupa'ia, or Banxring. See TREE-SHREW.

Tupelo, Miss., town, county-seat of Lee County; on the Old Town Creek and on the Mobile & Ohio and the Kansas City, Memphis & Birmingham R.R.'s; about 155 miles, in direct line, northwest of Jackson. It is in an agricultural and stock-raising region. The water supply is obtained from about 40 artesian wells. The chief industrial establishments are cotton compresses, cotton-gins, flour mills, spoke factories, furniture factories, and machine shops. The two banks have a combined capital of $100,000. It has a high school and graded schools. Pop. (1890) 1,477; (1900) 2,118. See TUPELO, BATTLE OF.

Tu'pelo, one of the several American trees of the genus *Nyssa*, order *Cornaceæ*. *Nyssa* is found also in Eastern Asia. They are swamp-loving trees, with alternate, entire, or nearly entire leaves, and regular, small, greenish flowers in capitate clusters, the fertile blossoms sometimes solitary, on slender axillary stalks, and appearing with the foliage. The drupe is more or less oval, with a compressed stone. *Nyssa sylvatica* is the sour gum, or pepperidge, growing farther north than the other species, and more apt to be found away from water, and made conspicuous in autumn by the scarlet of its foliage and by the dark-blue fruits, which are a valuable food for migrating robins. When leafless it is still noticeable, for the picturesque growth of its limbs, sometimes in round heads, often horizontal, as if the many knotty branches lay in strata. The bark is rough and gray. The wood is of a light color, but with a twisted grain, which makes it difficult to work. This unwillingness to split, however, makes it desirable for beetle-heads, ox-yokes, hubs of wheels, bowls, etc. Tupelo is durable when completely immersed in water, especially if salt, and is therefore of value for ships' keels; but it will not stand alternation of moisture and dryness. The southern mountaineers value it for "chaw-sticks," — small pieces of the stem, chewed into brushes with which they may dip up snuff. In consequence of its erratic growth and fibre, sour-gum trees were debarred as evidence in boundary disputes, in cases where some time had elapsed after blazing trees, as shown by the condition of the scar. *Nyssa ogéche*, called the Ogeechee lime, from the stream of that name, which is said to be about its northern limit, is an inhabitant of southern river-swamps liable to inundations. Its young branches have a silvery gray back, and the short petioled oval leaves are whitish pubescent beneath, when young, and are about six inches long. It becomes a large tree of handsome but somewhat peculiar habit. The fruit is of the size and shape of an olive (which caused the French in Mississippi to call this tupelo "the olive"), but is scarlet, and of an agreeable acid flavor. It is preserved in sugar. The wood is of little account, being soft, and the roots of one variety are so light that buoys for fishermen's nets were made out of them. *Nyssa aquatica* is the large tupelo, or "cotton" gum, so called because tomentose in all its more youthful parts.

Tupelo, Battle of. In March 1864, Gen. N. B. Forrest, at the head of a large force of Confederate mounted infantry, advanced from Mississippi and made a raid through West Tennessee to Paducah, Ky. Upon his return he assaulted and captured Fort Pillow (q.v.) on 12 April. Gen. Sturgis set out from Memphis to pursue him, and was badly defeated by Forrest, at Guntown (q.v.), 10 June, and pursued back to Memphis. On 5 July Gen. A. J. Smith, with Col. Grierson's cavalry division, two infantry divisions of Gen. J. A. Mower and Col. D. Moore, of the Sixteenth corps, and a brigade of colored troops, under Col. E. Bouton, in all about 14,000 men — 11,000 infantry and 3,000 cavalry — and 24 guns, left La Grange, Tenn., to march southward against Forrest, then reported in the vicinity of Tupelo, Miss. On the evening of the 7th one of Grierson's cavalry brigades, when near Ripley, attacked a Confederate cavalry force of 500 men, under Lieut.-Col. Hyams, driving it back and inflicting a loss of 35 killed and wounded, with a loss to itself of four wounded. Smith moved on through Ripley, crossed the Tallahatchie River at New Albany on the 9th, and on the 10th encamped about five miles north of Pontotoc. Next morning the march was resumed and Pontotoc was found occupied by McCulloch's cavalry brigade, supported by a brigade on a hill immediately south. The 7th Kansas cavalry were deployed as skirmishers and, supported by a brigade of infantry, advanced and drove in the Confederate skirmishers, and at the same time Grierson's cavalry, gaining the east side of the town, attacked the Confederates in flank and drove them from the place and the hill beyond, leaving several dead and wounded. Gen. S. D. Lee joined Forrest and assumed command of all the Confederate forces. Smith remained at Pontotoc on the 12th, and a reconnoissance developed the fact that the main Confederate force was about nine miles south on

the Okolona road, on the opposite side of a low, swampy bottom, through which ran two creeks, a position which he did not deem prudent to attack, and upon which he demonstrated only. Early in the morning of the 13th he marched out of the town eastward for Tupelo, 18 miles distant, on the Mobile & Ohio Railroad. Gen. Lee, informed of Smith's movement, ordered it checked before the railroad was reached; Forrest, with a brigade and a regiment made successive attacks upon the rear, which was covered by Bouton's colored brigade and the 7th Kansas cavalry, but was repulsed and kept back; and Buford's and Chalmers' divisions attacked the train in flank, causing the destruction of a few wagons, but were driven back by Mower's division, which captured some prisoners and a battle-flag. At dark Smith camped at Harrisburg, a mile from Tupelo, in good position on a knoll almost clear of trees, beyond which was a growth of timber. Mower's division was drawn up on the right of the Pontotoc road, on which the army had marched, and Moore's division on the left of the road, with Bouton's colored brigade on the extreme left. Meanwhile Grierson's cavalry division had occupied Tupelo, proceeded to destroy the railroad, and was then disposed on both flanks of the infantry. Early in the morning of the 14th Lee ordered Forrest to attack Smith's left, and at 7.30 A.M. Forrest, having dismounted his entire command, made an impetuous charge, with four brigades in line, supported by Chalmers' division and Lyons' brigade. The assault fell upon Moore's division and the left of Mower's, but failed to shake either, although four successive attempts were made. Between the assaults Forrest's artillery was very active, but was effectively replied to by two Union batteries, whose fire was so annoying that a brigade charged them, but was repulsed. After a hard struggle of 1½ hours Forrest withdrew from Moore's front, leaving many dead and wounded. He now marched to the left, crossed the Pontotoc road, and advanced in three lines against Mower, whose men reserved their fire, until the charging lines, closed in mass, were quite near; then they opened upon them with musketry and canister, driving them back in disorder; but they rallied and renewed the attack. For over two hours the battle raged on Mower's front; then he ordered his division to advance, which it did, capturing many prisoners, and driving Forrest from the field about noon. The afternoon was spent in caring for the wounded of both armies and burying the dead. About 9 o'clock in the evening Forrest made an attack upon the extreme left of the Union line, including Bouton's colored brigade. The attack was easily repulsed. At an early hour of the 15th Forrest's men advanced from the cover of the woods in front of Mower's division; Mower charged them, and they fled to their horses and rode away. Meanwhile another advance was made on the extreme left, held by Bouton's brigade. For two hours there was sharp artillery firing, when Forrest, under cover of his guns, came forward, but was met by a counter-charge, led by Smith, which broke Forrest's line and sent it in retreat. It was now past noon. Smith's ammunition had run low, and he had a scant supply of rations. Grierson had destroyed some miles of railroad, and after the last repulse of Forrest Smith moved slowly northward about five miles and went into camp for the night at Old Town Creek. The men were settling themselves for a rest when shells from the rear fell and burst among them. Bell's brigade, with a battery, had closely followed the column and attacked; Mower turned upon them; Crossland's brigade came up and joined Bell; but both were repulsed by Mower with severe loss, and fell back upon McCulloch's brigade, which held ground. McCulloch was desperately wounded, Forrest was wounded, and some prominent officers were killed. Smith resumed his march next morning, followed for two days by two brigades of Forrest's cavalry, and reached Memphis on the 23d. Smith had about 14,000 men engaged, and his losses, from the 11th to the 15th, were 77 killed, 559 wounded, and 38 missing. The Confederate troops engaged numbered about 6,600; their losses, as reported by Forrest, were 210 killed and 1,116 wounded. Consult: 'Official Records,' Vol. XXXIX.; Wyeth, 'Life of Gen. N. B. Forrest'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. CARMAN.

Tupper, tŭp'ẽr, **Sir Charles**, Canadian statesman: b. Amherst, Nova Scotia, 2 July 1821. He was graduated from Edinburgh University in 1843 with the degree of M.D.; began the practice of medicine in his native town, and in 1867–70 was president of the Canadian Medical Association. He entered political life in 1855 when elected as a Conservative to the Novia Scotia Assembly, and there became a leader of his party in the adoption of a more progressive policy, became provincial secretary in 1857, and in 1864 premier of Nova Scotia. He took a leading part in bringing about the union of the Canadian provinces and in the organization of the Dominion government, attending the Charlottetown and Quebec conferences, and the final conference at London. In 1867 he was elected to the Canadian House of Commons, representing his constituency there from 1867 to 1884, from 1887 to 1888, and from 1896 to 1900. He was president of the privy council in 1870–2, minister of inland revenue in 1872, and minister of customs in 1873. The Conservative government being defeated in the last named year, he became one of the principal organizers and leaders of the opposition, and brought before Parliament the plan of moderate protection for home industries, subsequently adopted by a Conservative administration. On the return of his party to power in 1878 he entered the government as minister of public works, and in 1879 organized and became first minister of the department of railways and canals; in this office he greatly assisted the construction of the Canadian Pacific Railway. In 1884 he went to London as high commissioner of Canada, returning for a time in 1887–8 to become minister of finance, but resigned that office in 1888 and resumed his position in London. In 1896 he again returned to Canada to enter the ministry, and was secretary of state until April, when he became premier; but his party was defeated in June of that year, and he was chosen leader of the opposition in the House. He lost his seat at the election of 1900, and retired from public life. In 1887 he was one of the plenipotentiaries to the fisheries conference at Washington, which resulted in the treaty settling the fisheries dispute. In 1879 he was knighted and in 1888 made a baronet.

Tupper, Sir Charles Hibbert, Canadian statesman, son of Sir Charles Tupper (q.v.): b. Amherst, Nova Scotia, 3 Aug. 1855. He was educated at McGill and Harvard universities, taking the degree of LL.B. at the latter in 1876. In 1878 he was admitted to the bar, and began the practice of law at Halifax, later practising in British Columbia. He was elected to the Canadian House in 1882 and re-elected in 1883, 1887, 1891, and 1896. He entered the Conservative government as minister of marine and finance in 1888, holding that office till 1894. In 1895 he was minister of justice and attorney-general, and for a short time in 1896 solicitor general. As minister of marine, he obtained the passage of several acts providing for the safety of ships and seamen; as minister of justice he dealt ably with the Manitoba school question. In 1893 he represented Great Britain in the Bering Sea arbitration tribunal at Paris.

Tupper, Martin Farquhar, English poet: b. London 17 July 1810; d. Albury 29 Nov. 1889. He was graduated at Christ Church, Oxford, in 1832; studied at Lincoln's Inn; was called to the bar in 1835, but never practised; and in 1838 published the original edition of his 'Proverbial Philosophy.' This he expanded into four series (1839–76). The earlier of these went through about 60 editions. By 1881 the work had reached the sale of 1,000,000 copies in America. The readers of it were either those whose ridicule made Tupper synonymous with the egregiously commonplace, or those who calmly absorbed the strange effusion with convictions that the author "had eclipsed Solomon." It was summarily treated by reviewers, parodied widely and cleverly, and for the years of its popular success remained a favorite butt of the critics. Remarks regarding him may be found in 'Passages from the English Note-Books' of Hawthorne (1870). His other writings, such as 'War Ballads' (1854), and 'Rides and Reveries of Mr. Æsop Smith' (1857), were less conspicuous. In 1851 and 1876 he visited the United States. Consult the autobiographical 'My Life as an Author' (1886).

Tura, too'rä, or Toora, Siberia, a tributary of the Tobol, 78 miles west of Tobolsk. Its length is 300 miles.

Tura'nian, a designation applied to the so-called agglutinative family of languages — that is, languages in which no proper inflection exists, but in which pronouns are made to adhere to the root of the verb to form the conjugation, and prepositions to substantives to form the declension. There must be no proper incorporation between the root and the adhering word; the two must simply lie side by side, agglutinated or "glued" together, but one must not modify the form of the other. The Turanian languages are agglutinative, while the Aryan and Semitic languages are inflectional, and the term Turanian is made to include every language of America, Asia, and Europe that is not Aryan or Semitic, with the exception of Chinese and its related dialects. (See Chinese Language and Literature.) Max Muller divides the Turanian languages into two great divisions, the Northern and the Southern. In the Northern he includes five classes, the Tungusic, Mongolic, Turkic, Finnic, and Samoyedic. He divides the Southern into four, the Tamulic or Dravidian languages of the Dekkan, the dialects of Bhotan, and Tibet, the Taic of Siam, and the Malayic of the Malay and Polynesian islands. He groups under these nine classes 116 dialects, to which others add Acadian, the Basque and North American tongues. There is serious doubt among philologists as to whether the agglutinative languages should be classed as a group, under a family designation, and Peile, in his work on 'Philology,' published in 1877, expresses the view that "these languages are much too different to give any ground at all for believing that they all belong to the same family." See Etymology; Language; Philology; Science of Language; Speech.

Turban, a covering of the head, worn by most nations in the Orient, and of very various forms in different nations and different classes in the same nation. It consists of a piece of cloth wound round a cap. The Turkish sultan's turban contains three heron's feathers, with many diamonds and other precious stones. The grand vizier has two heron's feathers; other officers but one.

Turban-shell, a top-shell (q.v.), of the genus *Turbo*, so called from its fancied resemblance to a Moorish turban; it is one of the commonest shells in the stock of every dealer in trinkets, polished to show its nacreous underlayers, or fashioned into some ornament.

Turbella'ria, a class of free-living platyhelminthes, characterized by the ciliated epidermis containing rhabdites, a delicate body and usually also a muscular protrusible pharynx. They were named by Ehrenberg in 1831 on account of the microscopic whirlpools produced in the surrounding water by the constant vibration of their epidermal cilia. Some of these forms are minute and resemble infusoria; such are the *Rhabdocœlida* (q.v.). With the exception of certain rare parasitic forms all *Turbellaria* are carnivorous; they overpower the prey, perhaps by the peculiar cutaneous structures (rhabdites) already noted, and then suck out the substance of the victim by means of the pharynx. The *Turbellaria* include three orders, based primarily upon the character of the alimentary canal, namely, (1) *Polycladida*, in which the intestinal branches are numerous, radiating from a common cavity above the pharynx; all are marine. (2) *Tricladida*, in which the intestine has three main branches, extending one anteriad and two posteriad from the pharynx. (3) *Rhabdocœlida*, in which the alimentary canal is straight and simple or at most slightly lobed. Almost all species are hermaphroditic, although in many male and female organs are in activity at successive periods rather than synchronously. The reproductive system is always complex. In many instances sperm masses are introduced into the body of a second individual by subcutaneous injection, being implanted in the skin at any point and compelled thus to make their way through the tissues to the proper location.

Tur'bine, in mechanics, a word meaning literally that which spins or whirls around; a wheel which revolves by the aid of water, air or steam and thus furnishes motive power for machinery. Although the steam-turbine is as old as the Christian civilization it is only within the last half century that it has been fully developed. The ordinary turbine with which we are most familiar is the horizontal water wheel made to revolve by the escape of water through

orifices, under the influence of pressure derived from a fall.

Water-Turbine Types.— There are three recognized types of the water-turbine, (1) the radial; (2) axial; (3) combined or mixed-flow. Turbine wheels are made in various sizes from 5 to 7 feet in diameter, with still larger sizes for extraordinary purposes. Perhaps the most powerful water-turbines in the world are those installed in 1894–5 for utilizing the power of Niagara Falls (q.v.). The supply of water to the turbine is regulated by a gate or gates, which can partially or entirely close the orifice where the water enters or leaves. The speed of a turbine is regulated by opening and closing the gate which admits the water. Where the power used fluctuates, the speed will fluctuate unless some method is adopted to adapt the power developed to the power utilized. This is usually done by means of a governor, which is so devised that when little power is being used the resulting increase in speed will actuate it to close partly the gate, and when much power is being used the decrease in speed will actuate it to open the gate wider.

High and Low Pressure.— Turbines are divided into high and low pressure, the former being relatively small, revolving at a high speed, driven by elevated heads of water. The low pressure turbines are relatively larger, contain a larger volume, and run at a lower rate. In the Black Forest, Germany, turbines are running with heads of 72 and 354 feet, and having diameters of 20 and 13 inches respectively. Low pressure turbines perform excellent duty with large volumes of water having only 9 inches head.

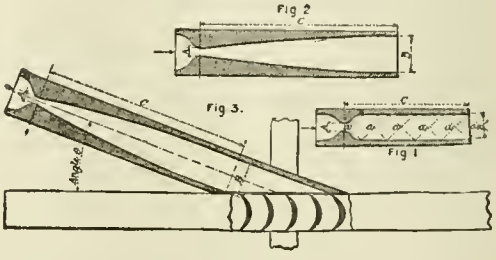
The Radial Turbine.— In radial turbines the water in passing through the wheel flows in a direction at right angles to the axis of rotation, or approximately radially. The water may flow inward from the circumference to the centre, or outward from the centre toward the circumference. The best known type of the inward flow is the Francis turbine, and of the outward flow the Fourneyron turbine.

The Axial Turbine, or parallel flow as it is sometimes called, is one in which the water flows through in a direction generally parallel with the axis of rotation. The water may flow from the top downward or from the bottom upward. The best known type of the downward flow is the Jonval turbine.

The Combined Turbine, or mixed flow, is any combination of the radial or axial; that is, the water may flow inward and up or down or outward and up or down. Still another classification is made to distinguish reaction turbines from impulse turbines. In the reaction turbine all parts are filled with moving water, while in the impulse turbine the buckets or other parts are only partly occupied by the water passing over them, the atmosphere having access to the remaining space. A reaction turbine is driven by the dynamic pressure of the water, which may be under a certain static pressure, due to the fact that the inflow takes place under pressure, since the wheel is always filled with water. In the impulse turbine the inflow takes place freely against air pressure only. Most turbines are built on the reaction principle. For a more detailed description of water turbines see HYDRAULICS; WATER-WHEEL.

The Steam-Turbine.— The earliest known steam-turbine was that invented by Hero which is described in an Alexandrian manuscript of about 120 B.C. This was not a practical invention, however, being merely a toy. Little progress was made in the turbine up to the 17th century. Branca made an impulse steam-turbine in 1624, and Edward Somerset followed with a device in 1650. The French engineer Tournaire is entitled to particular mention as having in 1853 indicated the capabilities of the steam-turbine. But the general introduction of the steam-turbine since 1890 is due to the Swedish engineer, De Laval, and to C. A. Parsons. Thus it is acknowledged that the progress of the steam-turbine is wholly modern and mainly recent. Only after evolution of the modern mathematical sciences could its action be understood and the machine be properly designed; only after modern tools and methods of mechanical construction had become refined could it be built in safe and economical forms. The influence of the Hero toy or Alexandrian invention upon modern engineering is shown to have been of great value. The Hero idea lay dormant during nearly 2,000 years which elapsed between the days of Greek philosophy and modern, practically applied, science.

Modern Development.— Steam-turbines are

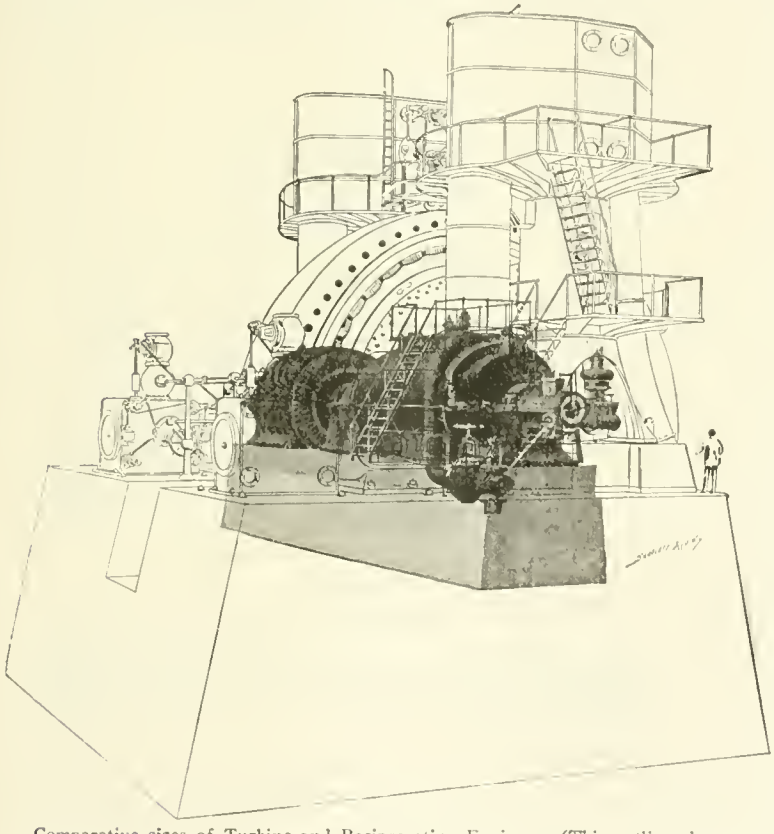


Turbine Jets.

heat engines, converting the calorific energy of the steam into directly-available mechanical energy. From another point of view they are analogous to hydraulic turbines, and in design, construction and operation, are controlled by the same ultimate principles. To-day the turbine is more nearly a "perfect steam-engine" than any other known type, so far as its design and construction are concerned. As in the case of hydraulic turbines the steam-turbine is divided into classes; the two principal ones being action and reaction turbines; and each of these classes is subdivided accordingly as the turbine is composed of a single wheel or of several wheels, traversed successively by the steam in course of expansion. Among reaction turbines (compared in hydraulics to the Jonval turbine) of which, as multiple machines, the prototype is the Parsons turbine, the steam is only partially expanded in the distribution, and acquires its full expansion in the movable wheel. The steam therefore acts on the blades at once by its pressure and its velocity. In the action turbine, the steam only acts on the movable wheels by its velocity. Each wheel revolves in a casing in which the pressure is uniform. Action turbines revolve at a less velocity than reaction turbines. There are now recognized three ways of utilizing steam for the transformation of heat into useful work: (1) By directing a jet of

steam on to movable objects, such as the blades of fans, or, in reaction wheels, by allowing the steam passage itself to revolve; (2) by condensing steam in a cylinder, and allowing the external atmospheric pressure to force a piston inward; (3) by cutting off slices of high-pressure steam, and expanding in the cylinders of the modern reciprocating engine. The present-day steam-turbine designer, however, is merely concerned with the first and oldest method.

The Impulse Steam-Turbine.— The simplest possible steam impulse turbine must consist essentially of a fixed nozzle guiding a jet of steam on to vanes arranged at a periphery of a rotating wheel in a very similar way to the buckets of the water-wheel; but to turn this wheel efficiently it is necessary not only to make the nozzle of suitable dimensions and shape for the work to be done, but to form the vanes or buckets of the wheel so that they make the best possible use of the steam as delivered from the nozzle. The function of the nozzle is to convert the whole available energy of the steam into mass velocity in the required direction. It should, therefore, be designed so as to expand the steam to the same pressure as that of the wheel chamber before the delivery on the vanes. If the nozzle is improperly formed, either the expansion will not be complete and the jet will burst into a cloud at the orifice, or eddy currents will be set up within the nozzle itself, and retardation of flow will be the result. To arrive at the best shape of steam nozzle, the ratio of expansion required should be first decided, and the area of entrance — A in Fig. 1 — should bear a relation to the orifice, B, in direct proportion to the increased volume of steam when expanded. The curve of nozzle walls is calculated to allow gradual expansion, until maximum velocity, due to initial pressure energy, is attained. Fig. 1 shows an example of what is found to take place in an incorrectly shaped nozzle. The steam particles rebound from the walls as shown by the dotted lines, and meeting at *a a a a* form points of greatest pressure. Turning again to Fig. 2, if the length, C, is too great, there will be retardation of flow due to the skin friction, and if C is too short the steam will not have time to expand completely. The area at A, then, depends on the quantity of steam to be passed; the area, B, on final pressure required, and the length, C, on the velocity of flow due to the difference between initial and final pressures. The best shape for wheel vane faces is undoubtedly as nearly a semicircle as is permitted by the angle of the nozzle in Fig. 3. This angle is usually about 20°, which is nearly the maximum possible. While being of sufficient area to reverse the direction of current without shock or eddy, these vanes should be short, so as to minimize skin friction, and the edges should be sharp to avoid blanketing the nozzle. The most efficient mean speed of vanes is just under half the velocity of the steam current, thus leaving the exhausted molecules relatively motionless. For this reason single disk turbines must revolve at enormous speed and be geared down for driving ordinary machinery. For example, a 10-inch De Laval turbine working at 70 pounds' pressure revolves 14,000 times per minute.



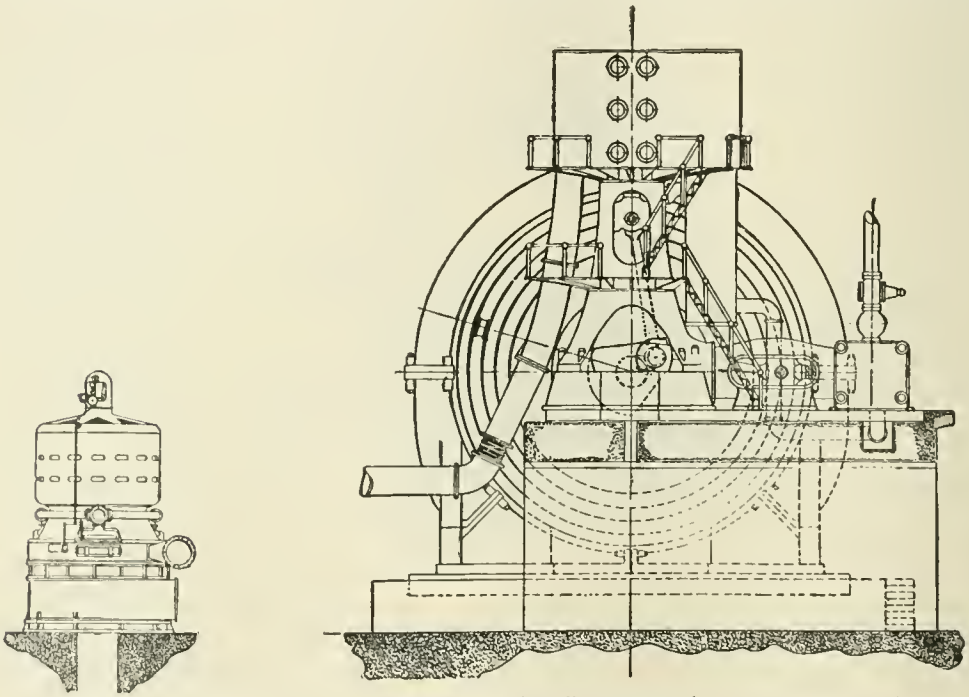
Comparative sizes of Turbine and Reciprocating Engines. (This outline shows one of the newest vertical reciprocating engines, enclosing a Parsons turbine-generator unit of the same capacity.)

The Multiple-Step Plan.— Geared motors are avoided by most engineers, and so the multiple-step steam-turbine was devised as a means for reducing the speed of rotation, and driving machinery direct. This idea was first developed by C. A. Parsons during 1884–7. The earliest Parsons parallel flow turbine was a collection of zigzag nozzles whose walls were formed by projecting rings of blades intermeshing, and so arranged that the "zigs" were fixed to the inner circumference of a stationary hollow cylinder and the "zags" to the outer circumference of a

rotable cylinder. The modern Parsons turbines from which such notably economical steaming results have been obtained differ from the earliest — apart from improvements in mechanical and constructional detail — only in the alteration of the contour of the steam passages or nozzles from a zigzag to a sinuous shape. Instead of turning sharp corners the steam now traverses flowing curves, and the cross sectional area of steam channels increases in nearly exact proportion to the growing volume of steam as it expands to the exhaust pressure, the collective areas at each stage fulfilling more closely the conditions for a perfect nozzle, as previously mentioned. But as expansion takes place both within fixed and moving blades, as the whole passage is one continuous nozzle, the clearances and workmanship must be of the finest to minimize leakage, which in the earlier machines caused serious trouble.

Prof. Curtis, of New York, has designed large steam-turbines which follow Parsons' very closely in theory, but are differently worked out mechanically. Few revolving disks of comparatively large diameter are arranged, and the fixed steam nozzles only play upon part of their periphery, in some cases only two nozzles being employed on the first disk. Provision is made for altering the nozzle areas according to load by opening or closing their tapered walls, thus to a certain extent permitting correct maintenance of expansion ratios for varying steam pressures and loads. Prof. Curtis argues that his arrangement of a few large nozzles and wheels in series lessens the percentage of waste through spilling of steam. In order to reduce the revolutions per minute as far as possible, Mr. Parsons appears to advocate a large number of turbines in series of small diameter, while Prof. Curtis believes in few wheels of large diameter. Prof. A. Rateau, of Paris, has worked out a multiple step impulse steam-turbine, consisting of a number of Pelton or Laval wheels arranged in series on a shaft, each wheel revolving in a separate chamber. Distributing nozzles convey the steam to the wheel vanes, and the whole of the expansion is accomplished within the fixed nozzles. The steam leaves the chambers at almost the same pressure at which it enters, the wheel vanes merely receiving the impulse due to the velocity of the particles; there is therefore in this case no tendency to leakage and no necessity for clearance.

The Dow Turbine.—The turbine invented by Dow is an inward-flow wheel with concentric sets of guides and vanes in series, and is said to have attained 35,000 revolutions per minute, working regularly at 25,000, consuming 45 pounds of steam per horse-power per hour. The Dow turbine, as built for work in connection with the Howell torpedo, gives an average of about 11 H. P. in coming up to speed in regular working, at 60 pounds steam-pressure, and weighs from 100 to 150 pounds, or not far from 13 pounds per horse-power. Its fly-wheel rim attains a speed of nearly 7 miles a minute at 10,000 revolutions per minute. The designer estimates its power at 150 pounds steam-pressure and the same speed at 40 H. P., or one horse-power to 3.75 pounds weight, and states that this may be still further reduced to the extraordinary minimum of 2½ pounds weight per horse-power, a figure within the estimated allowable maximum for use in aeronautic work. These engines have been successfully employed in driving electric machinery and in "spinning" the "fly" of the Howell torpedo. For alternating electric currents, this system possesses the



A comparative elevation of a 5,000 kilowatt steam-engine direct-connected to a generator, and a 5,000 kilowatt Curtis steam-turbine connected to a generator, showing economy of space.

peculiar advantage of permitting a "dynamo" to be employed having but two poles. In the United States, the substitution of the Dow turbine for the systems previously in use for spinning torpedos, has brought down the weight and volume of machinery from the earlier minimum of 360 pounds and three cubic feet per machine to 55 pounds and one cubic foot.

Future Possibilities.— Enormous opportunities are still open for the further development of the steam-turbine. The direction which these improvements must take is shown by experimental research, and the way is clearly visible to all scientific designers and inventors. It is easily shown that there are two, and practically only two, ways of securing further gain in the efficiency of the turbine, the one involving the refinement of the construction of the machine, the other relating to the treatment of the working fluid. The method is simple in its requirements, but the practical meeting of these requirements may involve some difficulties. The adaptation of the machine to driving high-speed machinery, to the turning of the armature or the field of the dynamo, to the purposes of the marine engineer, present promising problems. Their solution is already well advanced, in most cases, and we already know that the turbine may be made of use in the operation of machinery, as of alternating current generators in multiple, where the difficulties with other motors are found to be singular and serious. These advantages are illustrated by the engine-trials and scientifically conducted investigations lately effected.

The trend of progress is also toward the application of specially designed and constructed turbines to special uses. It is probable that, gradually, forms will be adapted particularly to use in electric light and power "plants." The regulation and adjustment of speeds constitute a problem, already satisfactorily solved in some cases, but which requires some further consideration in adaptation of satisfactory regulating mechanism to some special forms of turbine and to some special uses. The promise would seem to be the introduction very widely of a new type of prime mover which adapts itself in a peculiarly happy manner to purposes to which the common forms of steam-engine are not likely to prove as perfectly satisfactory. The indications are that the supply of power by means of this motor will be made as low as with the best types of reciprocating engine and possibly lower; while its simplicity of plan and ease of construction would seem to insure freedom from liability to either accident or depreciation of value to any important extent for long periods of time. The theory, design, construction and use of the machine are so well understood and the real so closely approaches the ideal that the engineer may readily see his way toward the solution of any practical problem of design that may be presented, while he also may as readily see a remedy for any observed defect of efficiency or of mechanical action. The perfection of the turbine is now being made the task of an immense number of learned men of science, of able practitioners and of skilful constructors. Probably never, in the history of engineering, was so simple a machine made the object of investigation of so large a number of able men, inventors, constructors, engineers and men of science. See also STEAM AND STEAM-ENGINE.

GARDINER D. HISCOX, M. E.

Turbine Navigation. The application of steam-turbines (see TURBINE) to torpedo boats, destroyers, gunboats, and cruisers, is to be anticipated from their unique capacity for developing great power and high speed with light and compact machinery. The conditions in a fast passenger steamer are favorable to the economical application of steam-turbines, and in such steamers the smoothness of their running will be a strong recommendation. C. A. Parsons, who has made remarkable developments in the steam-turbine, claims many advantages for the marine turbine engine. Among these many advantages he gives the following: (1) increased speed; (2) increased economy of steam; (3) increased carrying power of vessel; (4) increased facilities for navigating shallow waters; (5) increased stability of vessel; (6) increased safety to machinery for war purposes; (7) reduced weight of machinery; (8) reduced space occupied by machinery; (9) reduced initial cost; (10) reduced cost of attendance on machinery; (11) diminished cost of upkeep of machinery; (12) largely reduced vibration; (13) reduced size and weight of screw propellers and shafting. It may be said, generally speaking, that the larger the scale on which the engines are made, the simpler is the construction, the higher the steam efficiency, and the lower the speed of rotation.

The Turbinia Experiments.— In 1894 the steam-turbine had developed to such an extent that a syndicate was formed to apply the turbine to marine work, and a vessel, appropriately named the Turbinia, was built to develop high speed and to secure determinative measures of the value of steam-turbines in driving the screw-propeller. The first outcome of the experiment on the Turbinia was the discovery of a previously unsuspected cause of inefficiency at high speeds of rotation of the screw such as were adopted in this construction — "cavitation" by centrifugal action about the screw, which worked in a self-created cave in the midst of the water, throwing out the water faster than it could flow into the space by the action of gravity, even reinforced by the often still more active tendency to fill the vacuum thus caused. It was only when the speed of rotations of the screws had been reduced to 2,000 revolutions per minute, and after they were set in series of 3 on the same shaft, that the little boat made her famous run and attained a speed of 32¾ knots an hour, and later of 34½. The trials of the Turbinia were reported as follows:

"The mechanical friction of the turbines is particularly small, and the work spent on friction is not materially increased by increasing the range of expansion. This allows the steam to be profitably expanded much farther than would be useful or even practical in an engine of an ordinary kind. Apart from questions of friction the addition of weight and bulk to allow for this extended expansion would be enormous in the ordinary engine; in the turbine it is very moderate. Steam is expanded nearly 200-fold in the Turbinia and this is accomplished with engines which are much lighter than reciprocating engines of the same power, although in these the expansion would be much less complete. Rough weather was met with in some of the trials, but the Turbinia proved to be a good sea boat. The machinery worked with perfect smoothness, the screws did not race

and the bearings remained perfectly cool throughout. From first to last during the whole of the trials, there was no hitch whatever or difficulty of any kind in the action of the turbine. Some 20 were made under various conditions as to speed, the range of speeds tested extending from 6¾ knots to 32¾ knots. Two successive runs on the measured mile in opposite directions in smooth water and at the slack of the tide gave the following data:

TRIAL OF TURBINIA.

Time on the mile, first trial, 109⅘ sec.; second trial, 110 sec.
Corresponding speed in knots, first trial, 32.79; second trial, 32.73.
Mean speed in knots, 32.76.
Revolutions per minute, of high pressure and intermediate shaft, 2,230.
Revolutions per minute of low pressure shaft, 2,000.
Steam pressure in boiler by gauge, 210 pounds per square inch.
Steam pressure on admission to high pressure turbine, 157 pounds per square inch.
Greatest pressure in stokehold by water gauge, 7¼ inch.

The speed reached during this trial, 32.76 knots, in the mean was the highest recorded for any vessel. It is greatly in excess of the speed hitherto reached for a boat so small as the Turbinia. It is clear that the exceptional speed developed in the Turbinia has been achieved without sacrifice of economy, and that the substitution of turbines driving high-speed screws in place of reciprocating engines driving screws of much more moderate speed is not attended with increased consumption of steam so far as fast running is concerned."

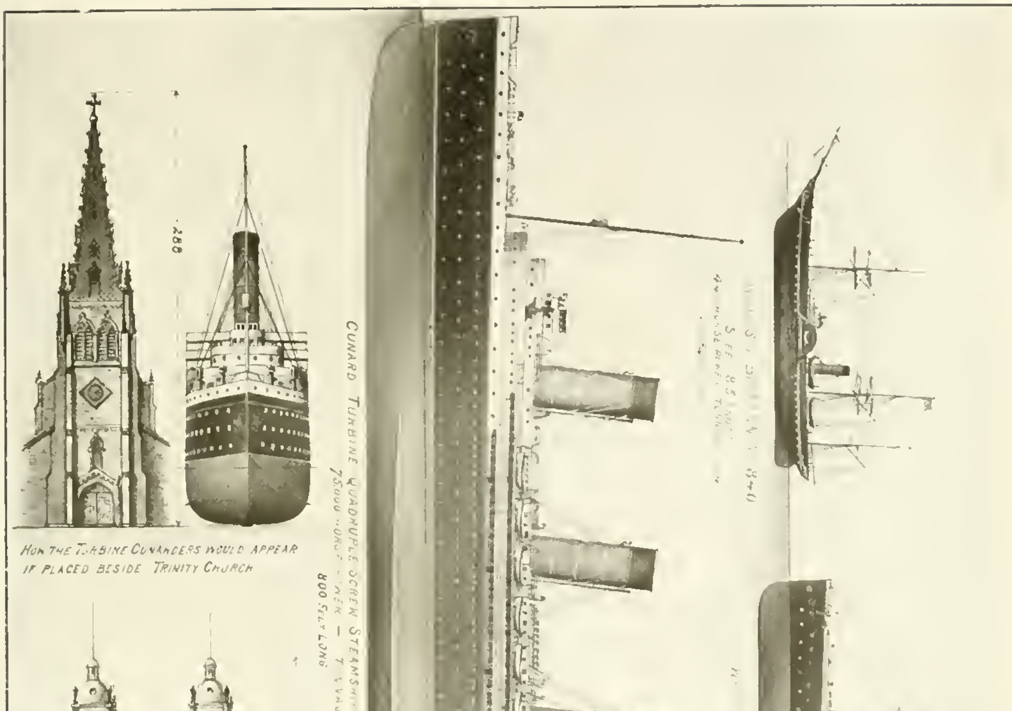
The Viper Destroyer.— The success of the Turbinia led to the construction in 1899, of a naval "torpedo-boat destroyer," Viper, and this craft, only 210 feet in length, of 375 tons displacement, developing 11,000 horse-power, on 15,000 square feet of heating, and 376 feet of grate surface, in water-tube boilers, with steam at 175 pounds by gauge; at 1,050 revolutions of the turbines, made over 37 knots, above 43 miles an hour. The contract speed was 35 knots. The turbines were two high and two low pressure, each driving a separate shaft carrying two propellers. The turbines were 35 and 50 inches in diameter. No vibration was produced by the engines, and the engine-room was so quiet that it was hardly possible to realize the presence of engines developing over 10,000 horse-power. Here, as in all craft of the sort, the extraordinary performance in power production, once all is understood, is that of the boilers; that of a horse-power for each 1½ square feet of heating surface, and from each square foot of grate about 30 net horse-power. This is probably the most extraordinary phenomenon in this or any other example of marine engineering. For warships of the destroyer class the absolute maximum of possible speed is the first thing to be desired, and the expenditure necessary to secure the extra speed is a matter of comparatively small importance.

The Turbine Passenger-Steamship.— In 1901 the turbine for passenger steamships was first adopted on the King Edward VII., a passenger steamer of a type in common use on the Clyde, built by William Denny Bros., of Dumbarton, Scotland. The builders, the Parsons Turbine Company, and a captain of long experience in the Clyde passenger trade and the steamers by which it is carried, were all equally interested in the venture. To insure that accurate data on which the performance of the turbine might be obtained, the King Edward was modeled as nearly as possible of the same size and same general design as the paddle steamer Duchess of Hamilton, one of the crack steamers running on the route for which the King Edward was designed. The latter, is, however, of slightly greater draft and more displacement. The weight of the motors, condensers, steam pipes, auxiliaries connected with the propelling machinery, shafting, propellers, etc., is 66 tons; which works out at about half the weight per indicated horse-power of the engines required for paddle steamers of the same type. Another advantage secured to the boat by the adoption of the turbine engines is increased deck space for passengers.

Steam is raised in a double-ended Scotch boiler of the ordinary type, 20 feet long by 16 feet 6 inches in diameter. There are four furnaces at each end, made to work under forced draft with closed stokehold. For purposes of comparison, the capacity of the boiler under these conditions might be set down roughly at about 3,000 indicated horse-power. It is, however, in the steam-turbine — the first engine to realize the dream of a perfect steam-driven rotary engine — that the chief interest in the craft is centred. The principle of the turbine is fortunately simple enough to make it easy of explanation. Inside the cylinder to which the steam from the boiler is led is a drum or hollow shaft studded with row upon row of blades or vanes, all set at an angle to the flow of the steam as the sails of a windmill are set to the breeze. It is apparent that the rush of steam, deflected from its course, by the first row of blades, would not reach the next in such a direction as would allow it to do its work effectively. To meet this difficulty there are, between each row of the working blades, a row of guide-blades fixed to the inside of the cylinder casing and set at the reverse angle. These blades are stationary, and their sole purpose is to again alter the direction of the flow of the steam and bring it back to the straight course from end to end of the cylinder before it meets the next succeeding row of working blades. The tops of the revolving blades reach nearly to the outer casing of the cylinder, and the stationary blades project inward until they almost scrape the revolving shaft or drum. A series of turbine wheels on one shaft are thus constituted, each one complete in itself, like a parallel-flow water-turbine; but, unlike a water-turbine, the steam, after performing its work in each turbine, passes on to the next, preserving its longitudinal velocity without shock, gradually falling in pressure on passing through each row of blades, and gradually expanding. There is no rubbing friction and no wearing parts except the bearings on which the main shaft or drum revolves.

Following are the net results of the comparative trials:

	Duchess of Hamilton	King Edward
Coal,	1,758 tons, 13 cwt.	1,429 tons, 16 cwt.
Mileage,	15,604	12,116
Miles per ton,	8.87	8.47
Number of days run,	111	79
Daily average consumption,	15 tons, 17 cwt.	18 tons, 2 cwt.
Average speed,	16½ knots.	18½ knots.


HOW THE TURBINE CUNARDERS WOULD APPEAR IF PLACED BESIDE TRINITY CHURCH
288
PARK-ROW BUILDING
390'
CUNARD TURBINE QUADRUPLE SCREW STEAMSHIP 1906 - SPEED 25 KNOTS
800 FEET LONG
SPEED 13.5 KNOTS

The success of the King Edward was so pronounced that arrangements were at once made to construct other vessels of the same type, to be engined also with the Parsons turbine. Steam-turbines of great size and power are likely soon to be produced for marine purposes, now that their performance has been found so satisfactory, and their construction on a large scale will enable the engineer promptly to settle many questions of interest which the earlier work on small machines could not fully solve. It would seem that the larger the scale of operation the simpler the problems of design and construction and the easier is the approximate of the real to the ideal in perfecting the system of energy conversion. Large turbines are comparatively low in speed of revolution, and it is considered that it would be entirely practicable to build an ocean steamer of large size, driven by turbines of 30,000 or 40,000 horsepower at high pressure, or more if needed, at speeds of revolution as low as 400 per minute or lower, employing four shafts and eight screws, requiring minimum steam and fuel for the work, while economizing enormously in space and weight. There would be no vibration or noise annoying to passengers, and their simplicity of construction and freedom from the multitudinous bearings of the now usual construction of engine would give insurance against either breakdown or minor troubles and delays from heated journals, leakages about the engine, or other annoyances and expenses inseparable from the reciprocating machine. See also STEAM VESSELS; STEAM AND STEAM-ENGINES.

GARDINER D. HISCOX, M. E.

Turbit, a breed of domestic pigeons, having a small flattened head and very short beak, a crest and a ruffled breast. The colors are various, but usually the body is white and the wings are colored.

Turbot, a European flounder (*Rhombus maximus*), brown and speckled in color, and usually weighing about 10 pounds, which is famous as a delicacy. It inhabits rather shallow waters in the Mediterranean, and in the Atlantic, but is rare northward of Scotland. Like the other flatfishes it lies on the bottom concealed by sand with which it covers itself partly and seizes such small fish as approach, displaying much activity in their pursuit. It spawns during the spring and early summer, and full grown females deposit between 5 and 10 millions of eggs. In the early stages of development the eggs are buoyant, but later sink to the bottom. The turbot is an important food-fish and much esteemed in England and on the Continent. Some are taken on hand-lines, but the bulk of the supply comes from the trawl-fishery in the English Channel. The nearest representative of the turbot on our Atlantic coast is the window-pane flounder (*R. maculatus*), so-called on account of its rhomboidal shape and a slight translucency, but this has very little value as a food-fish.

Turchin, tėr'chĭn, **John Basil** (IVAN VASILEVITCH TURCHININOFF), Russian-American soldier: b. province of Don, Russia, 30 Jan. 1822; d. Anna, Ill., 19 June 1901. After his graduation at the Artillery School, Saint Petersburg, in 1841, he entered the service as ensign, participated in the Hungarian campaign, and afterward was graduated in 1852 at the military academy for officers of the general staff. After the Crimean war, in which he attained the rank of colonel of the Imperial Guards, he removed to the United States and adopted the profession of civil engineering. When the Civil War broke out he was commissioned colonel of the 19th Illinois volunteers and came to command a brigade under Gen. Buell in Tennessee. He proposed a plan that proved successful in the capture of Huntsville, and in recognition of this service he was made brigadier-general. After the war he returned to his profession as civil engineer. In 1873 he founded in Washington County, Ill., the Polish society of Radom. He contributed to scientific and military periodicals and wrote 'Military Rambles,' and 'The Campaign and Battle of Chickamauga.'

Tur'didæ, Turdus, the family and genus of the typical thrushes (q.v.).

Turenne, Henri de la Tour d'Auvergne, ŏñ-rē dė lä toor dō-vārn-y tü-rĕn, VICOMTE DE, French commander: b. Sedan 11 Sept. 1611; d. Sasbach 27 July 1675. He learned the art of war under his uncles Maurice and Henry of Nassau, and in 1630 entered the service of France. In this service he distinguished himself in Lorraine and Northern Italy, and in December 1643 he received from Mazarin the command of the army of the Rhine. In August 1646 he succeeded, by a series of skilful maneuvers, in forming a union with the Swedes under Wrangel, and along with him defeated the Bavarians at Zusmarshausen, and compelled the elector to agree to a truce (March 1647). During the disturbances of the Fronde, which began in 1648, he at first sided with the malcontents; but after the death of his elder brother he changed sides, and defended the court against the Prince of Condé, who had previously been the main support of the court party. The victories of Turenne at Bléneau on the Loire (April 1652), and in the suburb of St. Antoine at Paris (July 1652), led to the termination of the civil war and the complete triumph of the court party; but during these disturbances the Spaniards had taken up arms, and now under Condé, who was so exasperated with the court that he joined the enemies of France, invaded Artois. Turenne was sent to repel the invasion, and gained a victory at Arras in 1654. But the war was prolonged for several years. At last his victory on the downs near Dunkirk in 1658, and the capture of Dunkirk itself in the same year, prepared the way for the Peace of the Pyrenees, which was concluded in the following year. In 1660 he was named marshal-general of the camps and armies of France. When the war was renewed with Spain in 1667 Turenne conquered Flanders in three months, and in the following year subjugated Franche-Comté in as many weeks. In the Dutch war of 1672 he had the chief command, and earned greater renown by his exploits during this war than in any other. Turenne first marched against the elector, Frederick William of Brandenburg, and having driven him back as far as the Elbe forced him to sign the Treaty of Vossem in 1673. In the winter campaign of 1674–5, which was signalized by the victories of Sintzheim, Mulhouse (1674), and Turkheim (1675), he delivered Alsace, which had been given up for lost by the ministers of Louis XIV., from the imperial

troops. This is the most brilliant campaign of his whole career. He was killed at Sasbach while making his preparations to engage Montecuculi.

Turfan, toor-fän', Eastern Turkestan, an important city on the south slope of the Tyan-Shan Mountains and on a tributary of the Tarim River. Its once important trade declined seriously in 1860–70 owing to the troubles in Kashgar. Pop. 30,000.

Turgai, toor-gī', Russian Central Asia, a district lying south of the government of Orenburg, and north of the Aral Sea. Area 176,270 square miles. It is traversed in the west by the southern extremity of the Ural Mountains. The rest of the country is steppes inhabited by Kirghiz and their herds. Pop. (1897) 453,123.

Turgenev, toor-gān'yĕf, Tourgenieff, or Turgenieff, Ivan Sergeyevitch, Russian novelist: b. Orel 28 Oct. (9 Nov.) 1818; d. Paris 3 Sept. 1883. He was educated at Moscow, Saint Petersburg, and Berlin, and in 1841–3 held an appointment in the ministry of the interior. For some years he lived as a country gentleman, gaining thus an intimate knowledge of Russian peasant life. For a short time he was imprisoned, then was held under surveillance on his estate, for a 'Letter on Gogol' (1852), displeasing to the authorities. Thereafter he lived chiefly at Baden-Baden and Paris. His first important publication was the 'Tales of a Sportsman,' and this was followed by a great number of short tales and dramas, contributed chiefly to Russian periodicals. His earliest novel, 'Dmitri Rudin,' was published in 1855, and this was followed by 'Helene' (1858); 'A Nest of Nobles' (1858), translated by Ralston, under the name of 'Liza'; 'Fathers and Sons' (1861); 'Smoke' (1865); 'An Unfortunate' (1868); 'Spring Floods' (1876); 'Virgin Soil' (1877), besides a great number of short stories. With these works he established a European reputation as a literary artist of the first order, and aroused an interest in the social and political condition of Russia. He was the first in Russia to understand the peasantry, and by his artistic rendering of its types he served, though he never directly approached the question, as a powerful agent toward the emancipation of the serfs. It was he who extended the meaning of the word «nihilist» to its present familiar application. Gradually he seemed to Young Russia to draw away from a liberalizing movement with whose extravagances and mistakes he was dissatisfied. He displays the melancholy and the psychological analysis so common to Russian writers. But the finish of his genre sketches; the structure and balance of his stories so alien to customary Russian craftsmanship; the breadth of his work — these were in the main peculiarly his own. They may be in part ascribed to his Western training and approbation of Occidental methods. He did not write easily, and the sum of his work is comparatively slight, but it has sufficed to rank him among the chief of modern artists in general literature. He visited England on several occasions, and received the D.C.L. from Oxford. The best translations are in German and French. That of 'A Nest of Nobles,' by Ralston (mentioned above), and of 'Virgin Soil,' by A. W. Dilke, are the English ones most worthy of mention. Consult: the monographs by Zabel (1883) and Thorsch (1886); De Vogüé, 'Le Roman Russe' (1888); Bourget, 'Psychologie Contemporaine' (1888); James, 'Partial Portraits' (1888); Turner, 'Modern Novelists of Russia' (1890); Waliszewski, 'Russian Literature' (1900).

Turgite, tėr'jit, a common iron ore much resembling limonite, with which it is usually associated. It is distinguished from it by its red streak, higher specific gravity, 4.14 to 4.68, and by its violent decrepitation when heated. It usually occurs in compact-fibrous, often botryoidal or stalactitic coatings on the surface of limonite. It then possesses a brilliant submetallic lustre on the outer surface and a much duller, satiny lustre on the broken fibrous surfaces. Its color is black or dark brownish-red; hardness 5 to 6. Its most typical American locality is in Salisbury, Conn. It also occurs in an earthy form like red ochre.

Turgot, tür-gō, Anne Robert Jacques, French statesman: b. Paris 10 May 1727; d. there 20 March 1781. In 1751 he renounced his intention of entering the Church, and in the end of the following year he was admitted a councillor of the Parliament. While fulfilling the duties of this position he also occupied himself with economical studies, and made himself well acquainted with the physiocratic system of Quesnay. In 1761 he was appointed intendant of Limoges, which pos' he occupied for 12 years, and was long remembered with gratitude for his wise, salutary, and benevolent reforms and regulations. On the accession of Louis XVI. in 1774 Turgot was first put at the head of the marine; but a few months later he became comptroller-general of France. He moderated the duties on articles of the first necessity without loss to the revenue; freed commerce from many fetters, and encouraged industry by enlarging the rights of individuals, and abolishing the exclusive privileges of companies and corporations. He also formed a project for commuting the feudal rights, for rendering salt an article of free merchandise, and for reforming the royal household. His reward for these useful and benevolent views was opposition and ridicule. He was however, able to carry into effect some very important improvements; but as he endeavored to control the nobility, restrict the clergy, and restrain the license assumed by the officers of the crown, they all united against him. The result was his dismissal from office in 1776, from which period he lived a retired and studious life until his death.

Turin, tū'rĭn, or Torino, tō-rē'nō, Italy, capital of the province of the same name, on the Po, 75 miles southwest of Milan. Its position at the junction of several Alpine mountain routes lends it much military importance. It contains numerous fine squares or *Piazzas*, chief of which is the Piazza Emanuele, unsurpassed on the Continent; Piazza Carlo Emanuele II. or Carlina; and others, usually embellished by equestrian statues or busts of distinguished men. The Nuovo Giardino Pubblico, along the river, botanical garden, Giardino della Citadella, Giardino Reale and zoological garden are interesting parks. The Renaissance cathedral (1492–8) has a marble façade, and contains the tombs of the Dukes of Savoy. Other churches are the Consolata, San Spirito, San Massimo,

Gran Madre di Dio, a Moorish synagogue, and a Waldensian church. La Superga is a fine Basilica on an eminence overlooking the town. The chief palaces are: Palazzo Madama, Carignano,— with natural history collections — Palazzo di Città, or town hall — containing a library and monuments — Palazzo Reale, or royal palace, with a royal armory, Palazzo dei Torri, Palazzo dell Accademia delle Scienze, with a fine collection of antiquities and a picture gallery, etc. The museums and Accademia Albertina delle Belle Arti, the exchange, arsenal, University (1404), theatres, hospitals, and numerous schools are the other important edifices. Manufactures are important and consist of silks, jewelry, furniture, pianos, gloves, leather, paper, soap, tobacco, machinery, and velvet hats. Turin was the capital of the modern kingdom of Italy until 1865; it was the ancient capital of the Taurini, a native tribe, and was the seat of government under Charlemagne, until 1032. The French captured the town in 1640 and in 1800 annexed it. In 1815 it was restored to the House of Savoy. Pop. (1901) 335,639.

Turk Islands, British West Indies, a group of small islands lying at the southeastern extremity of the Bahamas, north of Haiti, but forming, with the neighboring Caicos Islands, a dependency of Jamaica. Grand Turk, the principal member, is 7 miles long, but the Caicos Islands are larger. The chief product is salt. Total pop. of the dependency (1901) 5,287. See CAICOS ISLANDS.

Turkestan, toor-kĕs-tän′, Central Asia, the general name given to the region lying between Mongolia, China, and Tibet on the east and the Caspian Sea on the west. It is divided by the Mustagh range and a southwestern outrunner of the Tyan-Shan Mountains into East or Chinese Turkestan, and West or Russian Turkestan.

EAST TURKESTAN is bounded on the north by Sungaria, on the east by Mongolia and China, on the south by Tibet and India, and on the west by Russian Turkestan. Area 550,340 square miles. It consists of a desert plateau basin skirted by the Tarim River, and encircled on all sides by mountains — on the north by the Tyan-Shan, on the south by the Kuen-Lun, and on the west by the Pamir highlands. Agriculture is carried on only in the oases and in irrigated districts along the river, where cotton, tobacco and hemp are grown. The chief exports are silver, silks, felts, carpets and cotton. East Turkestan belongs administratively to the Chinese province of Sin Kiang. Pop. 1,200,000.

RUSSIAN TURKESTAN in its widest sense includes the entire southwestern portion of Asiatic Russia. It consists of the vassal states of Khiva and Bokhara in the south, the general government of the Steppes in the north, and the general government of Turkestan, or Russian Turkestan proper. The latter reaches from the Chinese Empire to the Caspian Sea, and consists of the districts or provinces of Samarkand, Fergana (with Russian Pamir), Semiryechensk, Syr-Darya, and the Trans-Caspian region. Area 649,644 square miles; exclusive of Trans-Caspia, 409,414 square miles. The extreme eastern and southeastern parts are mountainous, but the greater portion consists of vast arid steppes traversed by the rivers Amu and Syr Darya which flow into the Aral Sea. Only the irrigated portions along the rivers can be cultivated; they produce wheat and rice in great quantities, besides melons, grapes, fruits, and cotton. The nomadic inhabitants of the steppes are engaged in cattle raising. Wheat, raw cotton and cattle products are the principal exports, and trade has been greatly facilitated by the completion of the Trans-Caspian Railroad. The capital of the general government is Tashkent, and the pop. (1897) 5,260,406; exclusive of Trans-Caspia, 4,888,183.

Turkey, or The Ottoman Empire, an empire consisting of territory in the western part of Asia, southeastern part of Europe, and the northwestern part of Africa.

Turkey in Europe.— The central part of the Balkan Peninsula (q.v.) comprises the region in Europe which is under direct control of the Turkish government. It extends from lat. 42° 50′ to 38° 46′ N. and from lon. 29° 10′ to 19° 20′ E. The northern boundaries are Bosnia, Servia, and eastern Rumelia; the eastern boundaries, the Black Sea and the Bosporus; the southern boundaries, Sea of Marmora, the Dardanelles, Ægean Sea, and Greece; the western boundaries, Ionian and Adriatic seas and Montenegro. The additional territories in Europe which are under Turkish suzerainty, but not directly governed by Turkey, are Bulgaria (including Eastern Rumelia), Bosnia and Herzegovina (under Austria-Hungary).

Turkey in Asia.— The greater part of Turkish territory under the direct government of the Sultan is in Asia. Asiatic Turkey is bounded on the north by Russia, Black and Marmora seas, and the Dardanelles; on the east by Russia, Persia, the Persian Gulf, and Arabia; on the south by Arabia, Gulf of Aden, and the Mediterranean; and on the west by the Red, Mediterranean, and Ægean seas. It extends east and west from lon. 25° to 48° E.; and north and south from about lat. 12° to 41° N. From about lat. 28° N. south, the Turkish possession is a strip of land off the western part of Arabia, about 1,000 miles long and varying in width. The western boundary of this section is the Red Sea, but the eastern boundary is not well defined.

Turkey in Africa.— Tripoli and Barca are controlled by Turkey, and Egypt, Cyprus, and Samos are under Turkish suzerainty.

Topography.— Turkey in Europe has a long coast line. On the east and west coasts there are but few important indentations, but the south coast is more irregular. On the south are the gulfs of Saros, Enos, Lagos, Contessa, Monte Santo, Rendino, Cassandra, and Salonika, and the Bay of Kavala. The southeastern part forms a peninsula bordered by the Black and Marmora seas and the Bosporus. In the southern part and extending into the Ægean Sea is the peninsula of Salonika, which terminates in three long strips of rocky land, pointing south like fingers from the palm of the hand. Only a small portion of the boundary of Turkey in Asia is land; mountains mark the line of separation between Turkey and Persia and of the northwestern part of Turkey (Armenia) from Russia. The coast line is regular except the northwest and west coasts of Asia Minor (Bigha, Brussa, and Smyrna), which have numerous indentations and are fringed with thousands of islands. Some of the noted islands

over which Turkey has entire or partial control are Thasos, Crete, Rhodes, Scio (Chios), Cyprus, and Samos.

The surface of Turkey in Europe is mountainous; the main ranges are nearly parallel and extend northwest and southeast. The highest peaks are in the west and south; the principal chains or groups are the Ghegen, North Albania Alps, Rhodope, the Shar-Dagh, Perim-Dagh, and Mount Athos. Shar-Dagh has an elevation of about 10,000 feet, and Mount Athos 6,000 feet. The highest mountain ranges in Turkey in Europe divide the country into three natural divisions, which are known as Albania, Macedonia, and Thrace. The Maritza Valley is in the southeastern part; and the table-land of Janina adjacent, is from 1,300 to 1,700 feet above sea-level. Armenia, in Asia, has an uneven, rugged surface; many portions are crossed by bold and lofty mountains. The Taurus and Anti-Taurus ranges rising from lofty plateaus, extend from Persia to the Ægean Sea, and in many places send out short spurs which on the south slope to the plain, but on the north end abruptly. South of this high plateau is a lower one (Syria and Palestine) crossed by the Lebanon and Anti-Lebanon mountains. The third extensive natural division of Asiatic Turkey is the great plain of Mesopotamia. Many of the mountain peaks of Turkey in Asia are of historical interest, and have been given special articles in this work. Some of the most noted elevations are Mount Ararat (17,200 feet), which rises from the plain of Aras; near by Little Ararat (1,200 feet), Mount Ida, on Crete (Candia); Mount Herman, and almost every peak in the region called the Holy Land. The Alma-Dagh (ancient Amanus), a spur of the Taurus Mountains, is famous for its pass, the only one between Syria and the Euphrates. Other famous elevations are Manisa-Dagh (Sipylus), and Ershishi-Dagh (Argæus), both extinct volcanoes. The latter is about 13,000 feet above sea-level. The coast belt along the western part of Arabia (Hedjaz, Azir, and Yemen) is bordered on the east by mountain ranges which by condensing the moisture greatly modify the climate of this region.

Hydrography.— In European Turkey the chief rivers enter the Ægean Sea. In the eastern part is the Maritza (ancient Hebrus) which enters the Ægean Sea near Enos. Philippopolis and Adrianople are on its banks. It was on the bank of this river, near Adrianople, that, in 1364 occurred the battle between the Christians and the Turks, which resulted most disastrously for the Christians. Other large streams are the Struma (ancient Strymon), and the Vardar (ancient Axius). The Drin, Semeni, and Viosa flow west into the Adriatic. The Black and the White Drin are tributaries of the Drin. All the streams of the western part are short, and have rapid currents, in places they form deep channels, and numerous cascades. The chief rivers of Asiatic Turkey are the Euphrates (1,750 miles), the Tigris (1,000), and the Jordan. The Euphrates and Tigris approach each other near Bagdad where the Babylonia canal system begins. The name Shatt-el-Arab is given to the stream formed by the confluence of the two rivers, and through which their waters enter the Persian Gulf. Formerly the rivers flowed separately into the gulf which then extended farther inland. The Kizal-Irmak (Red River), the largest stream in Asia Minor, is about 600 miles long. The Mendere (ancient Mæander) flows into the Ægean Sea. The many and peculiar windings of this river have given us the word meander. The Jordan (q.v.) is one of the best known rivers in Turkey. Large salt lakes abound; the principal ones are the Dead Sea (q.v.) in Palestine, and Lake Van in Armenia. In the west central part of Asia Minor is a group of salt lakes. In Turkey in Europe there are several lakes, the largest of which is Scutari, which extends into Montenegro. Other lakes in European Turkey are Janina, Ochrida, Kastoria, and Presba.

Geology and Mineralogy.— The southeastern part of European Turkey belongs geologically to Asia. Devonian rocks are found on both sides of the Bosporus, and the similarities are multiplied by the fossils, the rock layer, the appearance of the river beds, and the nature of the soil and stone. Limestone, in Albania, exists in the mountain regions in long parallel folds, and the elevations have yet the rugged faces and uneven sides of comparative youth. Lava of considerable depth covers a large portion of the plains of Asia Minor. The marks of violent upheaval and of volcanic action abound. The mountains of Turkey are rich in minerals, but mining is yet in a crude condition. Manganese ore is found near Saloniki, meerschaum at Eskisheh, in Asia Minor, and copper, lead, coal, antimony, rock salt, emery, alum, nitre, iron ore, and chalk abound in many places. In European Turkey are found copper, alum, salt, iron, zinc, and silver and gold. Gold and silver are found in Smyrna, kaolin on the island of Rhodes, and mercury near Smyrna. A valuable lithographic stone is quarried near Brussa. A royalty of from 5 to 15 per cent is paid on all minerals which are exported from Turkey.

Climate.— The climate of Turkey in Europe is about the same as that of the countries in Europe which border on the Mediterranean; but radical changes occur frequently. The cold northeast winds which sweep down from the frigid regions of Russia modify greatly the climate of the north and south valleys. Albania is protected by mountains, and the climate is less variable than in other portions of the country; but sections of Albania are subject to drought and excessive heat. In the northern portions of Asiatic Turkey the winters are cold and humid; in the sheltered valleys the climate is comparatively uniform and warm temperate. In certain parts of Syria and as far north as Asia Minor, certain portions are subject part of the year to excessive heat. The rainless season is from April to September, but the heavy dews furnish a large amount of moisture. Mount Ararat, and the highest peaks of the Lebanon and the Taurus Mountains, are covered with snow all the year.

Flora and Forests.—Along the Adriatic coast are found fruits, flowers, and trees similar to those which abound in southern Spain and Italy. The principal forest trees are pine, oak, ash, lime, and beech. The common fruit trees are apple, apricot, cherry, and pear. On the lowlands of Turkey in Europe, and on the lower slopes of the mountains, are found a variety of evergreen trees; box, myrtle, palm, sycamore, and also walnut, almond, and carob trees. In Albania there are large olive and orange groves, and the plum and the peach abound except in


TURKEY IN ASIA
(ASIA MINOR)
AND TRANSCAUCASIA
SCALE OF MILES
Population of places is indicated by different lettering, thus.
SMYRNA
Mosul
BLACK SEA
MEDITERRANEAN SEA
CASPIAN SEA
RUSSIA
PERSIA
EGYPT
BULGARIA
ROUMANIA
TURKEY
CYPRUS
ALEXANDRIA
Damietta
Port Said
Jerusalem
BEIRUT
Tarabulus
DAMASCUS
ALEPPO
HALEB
Mosul
MOSUL
BAGHDAD
BAGHDAD
Kerbela
Kermanshah
Hamadan
Kashin
Resht
TABRIZ
Khoi
L. Van
Erivan
Alexandropol
TIFLIS
DAGHESTAN
BAKU
Batum
Trebizond
Tokat
Sivas
Kaisari
Angora
Konieh
KONIEH
Adalia
Gulf of Adalia
Mardin
Urfah
Stavropol
Simferopol
Sevastopol
Varna
Adrianople
CONSTANTINOPLE
Scutari
Brusa
SMYRNA
Rhodes I.
Candia
Crete
Urumiah Lake
25 feet below level of Black Sea
MOUTHS OF THE NILE

the high altitudes. The grape-vine and the citron flourish on the eastern and southern slopes and in the valleys. The roses from which the celebrated "attar of roses" is distilled, grow in abundance on the plain of Adrianople. Many of the flowering plants of Asiatic Turkey belong to the same families as those in European Turkey, but they differ in genera. The "cedars of Lebanon" still flourish, and on the lower slopes of nearly all the ranges are found cedar, cypress, and oak trees. On the plains are large groves of mulberry and sycamore, and in the valleys are grape-vines, groves of orange, olive, fig, pomegranate, and many nut-bearing trees. In Mesopotamia the date flourishes, and cotton, tobacco, and grains are easily cultivated. Some of the interior plains are almost treeless, and a large acreage is used for pasturage. Grasses, sage, wormwood, and broom grow on those plains. In Armenia there are extensive oak and chestnut forests. South of Armenia the grape-vine, lilac, and jasmine are features, and in the southeastern part of Turkey, near the Persian Gulf, are great varieties of palms. In the western parts of Syria and Palestine, grapes, apples, oranges, and nuts grow in abundance, and in Yemen and Azir the coffee plant is common. A species of maize grows wild on many of the warm lowland regions.

The forest laws (recent) are modeled after those of France; but no restrictive laws are enforced, and Turkey is being rapidly deprived of timber. In Turkey in Europe there were, in 1903, about 3,500,000 acres of forest, and in Asiatic Turkey, 17,000,000 acres.

Fauna.—The principal wild animals of European Turkey are the dog, cat, boar, badger, bear, civet, squirrel, chamois, roe, deer, beaver, mole, hedgehog, wolf, marten, fox, hare, and bat. Fish are found in large quantities and in nearly all the waters. Coral and sponge fisheries are extensive. Leeches exist in the marshes. There are over 240 species of birds of which about 100 are songsters. In Asiatic Turkey the boar, striped hyena, panther, and lynx are in Mesopotamia, and the lion is found near the Euphrates and the Tigris. In Asia Minor are the bear, jackal, wolf, and boar, and in Syria the hare, hedgehog, jerboa, leopard, mole, and wolf. In the Lebanon Mountains are found the Syrian bear. The domestic animals are the horse (the camel is more common), ox, ass, goat, and sheep. A famous species of goat is found in Angora (q.v.). The buffalo supplants the ox in many parts of Asiatic Turkey. The bee and the silkworm are raised in many sections, but especially in the southwestern part of Asiatic Turkey and in the valley of the Tigris. The locust infests both the southeastern and southwestern sections.

Soil and Agriculture.—The soil of Turkey in Europe is generally fertile except in the rocky and mountainous regions. The greater part of the lowland region of Turkey in Asia has a most productive soil, but lack of moisture makes some portions almost a desert. Irrigation has reclaimed certain localities. The soil in the valley of the lower Euphrates and Tigris is productive. The upper layer is an alluvial deposit from the two rivers, which formation still continues. So rich was the soil of this section in ancient times, that Babylon was called "the gift of Euphrates and Tigris." The chief occupations in all of the Ottoman Empire are agriculture and cattle raising, yet agricultural methods are most primitive, and only a small portion of the arable land is under cultivation. Agricultural development is retarded by the system of levying tithes on all the produce, and by the internal custom dues which oblige the farmer to pay a fee on all produce exported from one province to another.

The land is held under four different forms of tenure: (1) "Miri," or Crown lands; (2) "Vacouf," or pious foundations; (3) "Mulikaneh," or Crown grants; (4) "Mülk," or freehold property. The Crown lands form the largest portion and are held directly from the Crown. The government grants permission to cultivate an unoccupied tract, and in return exacts a certain fee; but continues to exercise the right of seignory over the rented land. If the lessee neglects to cultivate the land for three years in succession, it reverts to the Crown, and again becomes "unoccupied land." The "Vacouf" lands were instituted originally to provide for the maintenance of the religion of the state and for the education of the people. These lands are now mostly in possession of government officials. The "Mulikaneh" lands were granted to the old feudal troops as a reward for military services. The title to such lands is hereditary, and the land is exempt from tax. The freehold lands do not exist to any great extent, but some of the peasants have purchased "Mülk" lands from the government. The principal agricultural products are cotton, coffee, tobacco, opium, madder, and cereals. Fruits and nuts common to the southern part of Europe are raised. There are in all the empire about 44,500,000 acres under cultivation (1904). The farmers produce but little more than is required for their own use, on account of the system of levying tithes on all farm produce and the exportation taxes on all produce sold and exported to other countries or to different parts of their own country.

Manufacturing and Other Industries.—The manufactured products are mostly hand made. Although there is an abundance of raw material, manufacturing has declined since about 1850. The carpets for which Turkey was once famous, the woolen goods of Macedonia, and other products, have in almost all parts of the empire been undersold by the machine products of other countries. In 1903 there were in Damascus about 5,000 hand-looms and 10,000 workmen engaged in weaving silk, woolen, and cotton goods. A few glass factories and several paper mills have been established. Turned-brass and beaten-copper utensils for household purposes are made by hand. There are a few steam manufactories in Constantinople and Saloniki. In 1900 there were about 92 mines in operation. Fishing is an important industry. In 1903 the fisheries of the Bosporus represented $1,300,000. The sponges obtained along the Mediterranean rank with the best in the world. Pearls are obtained from the Persian Gulf, and mother-of-pearl from the Red Sea.

Transportation.—During the last 16 years Turkey has had railroad communication with Europe. There is one main line starting from Constantinople and one from Saloniki. The shortest distance to Egypt is from Saloniki. There are (1903) 1,269 miles of railroad line in European Turkey and 1,667 miles in Turkey in Asia, making a total in the Ottoman Empire

of 2,936 miles. German railroads are (1904) being constructed in parts of Turkey and will eventually connect a number of places; one being from Konia to Adana, Mosul, Bagdad, and Barrah with many branch lines and with an extension to Kowiet. The Bagdad Railroad Company, with headquarters at Constantinople, has a transfer of the grant given to the Anatolian Railway Company. The Turkish government paid to the European Guaranteed Railways $1,688,955, and $1,832,545 to those of Asia; in 1902 to the European $1,669,775, and to the Asiatic $1,724,090. In 1902 the receipts from the railroad traffic were $850,750.

Commerce.—Commerce as well as agriculture seems to be greatly retarded and its development prevented by the duties on imports and exports, and the taxes imposed on the trade between different divisions of the empire. All articles imported into Turkey are taxed 8 per cent ad valorem, except tobacco and salt, which are monopolies. There is an export duty on all produce sent abroad, except cereals, and all produce sent from one division of the country to another pays the 8 per cent. The import duties for the fiscal year (part of 1899 and of 1900) were $8,900,000; export duties about $713,325. The total trade of Turkey can be partially understood from a comparison of the years 1895 and 1900. The exports for 1895 were about $68,769,025; for 1900 about $77,957,000. The imports for 1895 were about $120,377,000; for 1900 $122,482,000. The exports from which Turkey receives the principal part of its export revenue are salt, wines, cocoons, raw silk, waste silk, frisons. Turkey's trade with Great Britain is nearly as much as the combined trade with all the other 21 countries with which it has commercial intercourse, although it has considerable trade with the United States of America. In 1903 Turkey in Europe exported to the United States: rugs and carpets, $2,253,288; tobacco, $840,874; hides and skins (chiefly goatskins), $812,218; oils $206,292; wool $187,798. Turkey in Asia exported to the United States the same year: licorice root, $987,287; wool, $575,273; opium, $401,113; figs, $363,678; dates, $213,603; raisins, $126,227. The exports of Turkey in Africa to the United States the same year were: Cotton (raw) $9,525,533; sugar, $1,351,038; gum arabic, $206,193; total, $21,233,453. The imports from the United States into the different divisions of Turkey, during 1903, consisted principally of cotton (manufactured), iron and steel, agricultural implements, provisions and bread stuffs, and amounted to $1,313,407. The Department of Agriculture of the United States is making efforts to grow Egyptian cotton in the United States.

Shipping and Navigation.— The shipping and navigation facilities of the Turkish Empire consist (1901) of 107 steamers with a total carrying capacity of 58,861 tons; sailing vessels 916 with a tonnage of 179,883. The vessels entered and cleared at all the ports of Turkey during the year from March 1900 to March 1901 were 188,034, with a tonnage capacity of 34,332,877; 10,450 steamers entered and cleared in 1902 at Constantinople alone, tonnage 15,238,775; 4,225 were British steamers and 1,842 Greek. The vessels of the regular mailship companies enter the principal ports, particularly Constantinople.

Army and Navy.— The army and navy are important parts of the government of the Ottoman Empire. In Turkey every Mussulman is obliged, if called upon, to give 20 years military service to the government. The liability begins at the age of 20. Those who are not Mohammedans are not liable to the military service in person, but they must pay a tax levied on all male persons of all ages. The Nomad Arabs are liable to military duty and may be drafted into the service, but they usually try to evade service and avoid furnishing recruits. So also the Nomad Kurds are liable, but they generally evade service. The Turkish army is made up as follows: (1) The Nizam, or regular army and its reserves; (2) the Redif, or Landwehr; and (3) the Mustahfuz, or Landsturm. Turkey exercises the power of keeping its army recruited by conscription. The conscripts are divided into first and second levies. The first serve six years in the Nizam, four of them with the colors and two of them with the reserve; eight years in the Redif, four in the first and four in the second; and six years in the Mustahfuz,—in all 20 years. The second constitute what is called the Tertib-Sani and the muinsir, and form part of the reserve. They have nine months' drill the first year, and 30 days each subsequent year when not in actual service. There is also another organization of Ilaves called "Second Class Redif," but the disbandment of this class and also the Bashi-Bazouk force has been required by the Powers. There are seven military districts in the empire; the headquarters are at Constantinople, Adrianople, Monaster, Erzinjan, Damascus, Bagdad, Sanaa (the Yemen). The war strength of the Turkish army is (1903) about 1,400,000. The crews of the navy of Turkey are raised in the same manner as the land forces, partly by conscription and partly by voluntary enlistment. The time of service in the navy is 12 years. The nominal strength of the navy is now (1904) 6 vice-admirals, 11 rear-admirals, 208 captains, 289 commanders, 228 lieutenants, 187 ensigns, 30,000 sailors, and about 9,000 marines. The navy has many old ironclads and some of them are still in use, but they are now of very little value as war vessels. Two new vessels are (1904) being constructed for the Turkish navy, one at Philadelphia, Pa., and one at Elswick, England. They are each 3,225 tons, speed 22 knots, and carry two 6-inch guns, and seven 4.7-inch, and have 2-inch armor decks. An old battleship, the Missoudiyck, has been rebuilt in Italy. It has now two 9.2-inch guns and 12 6-inch and is over 17 knots an hour. There are also now in the navy two torpedo gunboats and four large torpedo boats of modern construction.

Religion and Education.— Mohammedism is the officially established and recognized religion, but other forms of worship are tolerated. In 1897 the Moslems formed 92.23 per cent of the whole population; the Christians, 7.50 per cent; the Jews 0.26 per cent: and others 0.01 per cent. The Koran (q.v.) is the supreme authority in religion as in law and government. The Sultan is looked upon as the direct successor of Mohammed. The Christians in Turkey belong chiefly to the Greek, Roman Catholic, and some Protestant churches. The Maronite, some of the Armenian, Copt, and Greek rites acknowledge the supremacy of the Pope. The Ansaries

1. Mosque of St. Sophia, at Constantinople.
2. The interior of St. Sophia.

and Druses are in Syria (q.v.), and other religious denominations are allowed to exist in various portions of the empire. In 1903 there were 2,120 mosques in Turkey, of which number 379 were in Constantinople (see GOVERNMENT).

In 1869 a change in educational matters was instituted when provisions were made for establishing elementary schools, for boys and girls, in every commune, a higher grade of schools in every town, industrial and normal schools, and a university. Elementary instruction is nominally obligatory for boys from 6 to 11 years of age, and for girls from 6 to 10 years. The subjects included in elementary instruction are the Turkish language, the Koran, history, geography, arithmetic, and hand-work of various kinds. The additional subjects for the higher schools in charge of American Protestant missical and natural sciences, and geometry. An imperial school of medicine was founded by the government as early as 1826. There are a number of government schools. In 1900 a Moslem university was founded in Constantinople. The Greeks have a theological school and a number of other schools. The American Congregationalists established Robert College at Constantinople, the American Presbyterians have a college at Beirut, and several elementary schools in charge of American Protestant missionaries have been established in different parts of the empire. The Roman Catholics have a number of schools for boys and girls. Their colleges and elementary schools are connected chiefly with their missions. In 1899 there were 10 colleges and 40 high schools in charge of Americans and a greater number in charge of the French. In 1900 there were in the empire about 36,230 schools, which contained 1,331,200 pupils.

Literature.—For the Turkish student the Koran is the book of religion, law, and literature. The Arabic language is one which every good Mussulman seeks to learn. The Persian language has likewise aided in forming the Turkish literary taste and the Turkish literature. Persian and Arabic phrases have been embodied in the language and writings of the educated Turks. To master the literature of the Ottoman Empire it is necessary to know three languages. The sultans since the foundation of the Ottoman dynasty have always promoted intellectual movements among the Moslems (see GOVERNMENT). They have tried to execute the command given by the Prophet to his people: "To seek knowledge even if it were to be found in China"; and that "it was permitted to Moslems to possess all sciences." Othman I. (1288–1326), the founder of the present Turkish dynasty, was zealous in encouraging the extension of the religion of Mohammed, and the acquisition of learning among his Moslem subjects. The last words he spoke to his son and successor were: "My son Orcha, be thou the protector of the faith and the sciences." It was this son who built the first college at Brussa, in Asia Minor, then the capital. The fame of this school went abroad and pupils came to it from many parts of Asia. Bajazet I. (1389) did great work in fostering Turkish literature. Prince Djem, son of Mohammed II., "Conqueror of Constantinople" (1451–81), was a poet. He dedicated his work 'Tjimshid and Hourshid' to his father. The same ruler frequently said to his people that "the study of sciences was a divine precept which the faithful should follow." He transformed many of the finest Greek churches into mosques, and commanded that such churches should be used not only for religious worship, but also as schools for the study of theology, law and philosophy. Thus he made the church the centre of religion and education. The enthusiastic students were called "Sohtes," that is, inflamed (for learning), and the name "Sohtes," or "Softas," is still applied to Turkish students.

Four of the seven ministers of Mohammed II. were poets. Authors of renown in other countries were brought to the Turkish capital and entertained at the expense of the state. About 30 famous writers were guests of the government at one time. Other writers not residing in Turkey, who in any way aided Mohammed II. in fostering good literature in his own country, were suitably rewarded. The Turkish poet, Ahmet Pasha, lived at this time; also Sinan Pasha, a prose writer. The beauty of the imagery of Sinan Pasha may be seen in the following passage taken from an article on the glory and power of God: "Thou art such an inventor that from nothing Thou makest a Treasure. Thy Wisdom stands so high in the firmament that the sharpest eye cannot see it; neither can any one discover Thy hidden Glory. There are no limits to Thy Learning; no limits to Thy Power. Thy Eternity is such that neither the past nor the future generations could have preceded Thee." Bajazet II. (1481), son of the Conqueror, was a poet. Bihirshi, a writer of this period, left 366 volumes of historical books, which were not all he had written. After his death, the Sultan had all burned except 83 volumes, as the others he declared were not worthy the fame of Bihirshi. The history of the Ottoman Empire, written by Idris, is considered a work of literary merit as well as of authority. There have been a number of women writers who rank high in the estimation of Turkish scholars. Mihri is called the Turkish Sappho. Titnet a poet; Djemali, a jurist as well as writer, lived during the reign of Selim (1512–20); and Baki, one of the best lyric poets, was a favorite of Solyman the Magnificent (1520–66). Some of Baki's poems have been translated into German, English, and French. Hiali was a poet of merit; Zoungouli wrote 'Leila and Medjnoun,' the "Paul and Virginia of the East." During the reign of Solyman there lived over 100 poets of merit. Kastamuni, in Asia Minor, boasts of having been the home of 300 poets. The modern Turkish scholar points with pride to the list of writers on law, theology, and history who lived during the reign of Solyman. The historians Ali, Saadtdin, and Ak Hassari flourished in the first half of the 17th century.

Internal dissensions from about 1603 to 1648 retarded literary development. The one name which stands out prominent during this period is that of Kodja Bey. During the last half of the 17th century Turkey produced such writers as Riazi, Aziz, Hadji La Kalfa, Mezati, Ahmet Kioprili, Teuni, Assian, Sari Abtullah, Missri, and Nali. The last was called the "king of con-

temporary poets.» Some of the noted historians of the same epoch are Ali, Husseim, and Naima. Ibrahim, a distinguished writer of the 19th century, prevailed upon the Sultan to introduce the art of printing. Raghib Pasha, a poet and moralist; Assim, a historian and poet; and Naima belong to the 18th century. The 19th century brought the Turkish writers into closer contact with the French and thereby introduced them into the world of fiction, tragedy, and comedy. An entirely new character has been impressed upon modern Turkish literature, caused chiefly by closer commercial relations with western Europe. The translations into English of many of the works of Turkish authors through the influence of Baron von Hammer, has made the English scholars appreciate the vast field of folklore, fable, and history covered by the works in the libraries of the Ottoman Empire. Dictionaries, grammars, and other works written for English-speaking students have been prepared with care and are necessary aids in the study of the Turkish literature.

Archæology.—The modern explorers, excavators, and decipherers or translators, have given us a new world, a large portion of which is below the surface of the territory occupied by the Ottoman Empire, chiefly in Babylon, Asia Minor, Palestine, Egypt, Assyria, and Arabia. The land of Babylon and Nineveh, of Assyria and Khorsabad would naturally be fruitful in records of the past. The number of cuneiform documents found in Macedonia alone are of great value. One of the causes which have contributed to the recent activity in searching for archæological remains is the desire to secure corroborative testimony in favor of the Bible. Such reasons greatly influenced some of the American missionary societies to begin investigations. The University of Pennsylvania sent out an expedition which discovered, in the vicinity of Nuffar, 2,000 cuneiform tablets, many of which were in existence 2,800 years before the birth of Christ. Doctor Hilprecht (q.v.) was appointed to supervise the editing and classifying of the results of the expedition. The collection contains many inscribed bricks, clay stamps for bricks, marble vases, sacrificial vessels, door sockets, enameled and plain vases, seals and seal cylinders, gold and silver ornaments, clay sarcophagi, stone, iron and bronze articles, bas-reliefs, intaglios, human skulls, and numerous other articles. The American Archæological Institute explored the territory near Asso (present Behram) in the years 1881–2. The excavations brought to light buried fortifications of successive periods, baths, theatres, temples which were of the archaic Doric order and down to and within the Christian era, porticos, private dwellings, a gymnasium, a Greek bridge, and a highly ornamented group of tombs. Other exploring expeditions have been sent to Turkey by the French, English, and Germans, and the Turkish government has given the matter considerable attention. In an article on the Turkish excavations by Americans, written by James B. Fox, he says: «The dreary solitudes that long brooded over those buried civilizations have begun to disappear before the labors of dauntless and indefatigable explorers, and a literature, almost overwhelming in extent, graven in clay and stone, transports us back to the very cradle of the race. They reveal a perfection of art, a marvelousness of correspondence, a development of civilization in those primeval days that excite the wonder and admiration of our more enlightened age. Schools and libraries must have existed everywhere; clay books were stored in the cities; letters of every description were exchanged on every subject; and, judging from the tablets of Zel-el-Amarna, Canaan was a centre of correspondence, even before the age of the Exodus. The objection of the 'higher critics' that Moses could not have written the Pentateuch, because the art of writing was unknown in his day, falls hopelessly to the ground.»

The whole country, especially Syria, Palestine, and Babylon, contains vast archæological treasures. Specimens of Byzantine architecture still exist in a good state of preservation. The statues found among the ruins of ancient Nineveh, and preserved in the British Museum, are remarkable monuments. The half tamed Turk had wandered for centuries over the plains near the Tigris without ever dreaming that he was crossing the place of sepulchre of a once gorgeous city, until Sir Henry Layard (q.v.) and other English explorers began the excavations which restored Nineveh to the world.

The Turkish government has, since 1884, opposed the removal of objects of antiquity from the country, and no excavations may be made without a firman. The government has a valuable collection of archæological specimens at the museum of Tchinli Kiosk. The splendid archaic frieze of the Doric temple in Assos is not in one place, but portions are in America, Paris, and Constantinople. Facsimiles of some of the famous statuary found in Nineveh (originals in England) are in museums in New York and other places.

Post-offices.—There are (1902) only 1,297 post-offices in the Ottoman Empire. During the official year (parts of 1901 and 1902) the inland postal service transmitted 16,444,000 letters and postal cards, and 2,297,000 samples and papers. The number transmitted in the international service was: letters and postal cards, 8,024,000; samples and printed papers, 2,520,000, during the same period.

Telegraphy.—Turkey has (1903) about 25,100 miles of telegraph lines with about 39,800 miles of wire. There are 907 telegraph offices.

Finance.—The public revenue of Turkey comes from the following sources: direct taxation, tithes, verghis (land and property tax), temettu (income tax), for exemptions from military service, aghnams (tax on sheep, etc.), and other sources; indirect taxation, various customs (salt, tobacco, spirits, stamps, fisheries, silk, and other sources), administrative, military departments, share in tobacco Régie profits, tribute revenues, and other sources. The total receipts for 1897–8 were about $92,556,000. Expenditures for the same fiscal year were about $92,147,000. The reports on finance show a yearly deficit, chiefly on account of extra military expenses. The Turkish debt (1903) was secured on Egyptian tribute, $96,815,290; secured on administered revenues, $385,165,000; conversion loan, series B, C, D. (1890), about $1,158,000; lottery bonds, $57,599,000; various loans (1890–1903), $55,069,000; other loans (1894–1902), $55,800,000; making a total of $652,506,290. In the above is the

Russian war debt (1898), $122,565,000; indemnity to Russian subjects, $3,750,000; and $1,367,470 to the Damascus Serghis Railway.

Money.—The money of the empire consists of gold, silver, copper, and a bank-note circulation. The Imperial Ottoman Bank had, on 31 July 1903, a note circulation of about $6,116,950, and cash $11,103,750, and a capital of about $55,000,000. The coinage of gold, including re-coinage of old coin, from 1891 to 1903, amounted to about $11,073,450; of silver $2,965,710; of copper (1900) $112,695. Of the gold, $622,750 was coined from old Turkish lire, and $730,450 from English sovereigns. The whole coinage of silver was from piastre pieces. The amount of the money of the empire is (1903) about 3,416,606,600 gold piastres, or $150,330,690; and of silver piastres about 963,713,500, or $42,403,394, in all about $192,734,084. The Turkish lira equals $4.40. The "purse" is equal to about $19.80 and is used in recording large sums. The gold lira is .916 fine and weighs 7.216 grams and contains 6.614 grams of fine gold. The silver piastre weighs 24.055 grams, 839 fine, and has 19.965 grams of fine silver.

Weights and Measures.—The principal measure is the "kilch." Turkish weights and measures were assimilated to the metric system in March 1882, but under the old names; and this made so much confusion that the change did not go into general use. In 1889 the metric system was declared obligatory for cereals, and again in 1892 the decree was made of obligation; but these decrees are still (1904) not enforced. Some of the old measures are donum (land measure), 40 square paces; arshin (land measure), 30 inches; the ardaze (cloth measure), 27 inches.

Area and Population.—For centuries the area of Turkey was subject to the changes resulting from wars and conquests. Internal dissatisfactions were fostered by external rivals, for Turkey as the Ottoman Empire has always been a menace to the safety of adjacent nations. Since the great powers of Europe have taken charge in a measure of the affairs of Turkey there have been changes, but usually predicated ones. The results of late conferences (Constantinople, 1903) indicate pre-arranged plans of division or control, so that the official conference room has to some extent replaced the battlefield, but the results are somewhat similar. In 1902 the area of Turkey was as follows:

	Area sq. miles.	Population	
EUROPE:			
Immediate possessions	64,582	5,891,700	
Bulgaria (vassal state)	24,380	2,641,335	
Eastern Rumelia (practically part of Bulgaria)	12,931	1,091,854	
Crete (autonomous)	3,327	309,349	
Bosnia and Herzegovina (in Austrian occupation)	19,728	1,591,036	
Thasos (Egyptian)	152	12,140	
	125,100		11,537,414
ASIA:			
Immediate possess'ns.	681,985	16,898,700	
Samos (principality)	181	54,834	
	682,166		16,953,534
AFRICA:			
Egypt (practically British)	383,800	9,821,045	
Tripoli and Benghazi	398,892	1,000,000	
	782,692		10,821,045
Total	1,589,958		39,311,993

Total population in 1904, est., 41,000,000.

Constantinople (q.v.), the capital, had a population of about 1,200,000; Damascus and Smyrna, over 220,000 each; Bagdad, Saloniki, Aleppo and Beirut, each over 120,000; Adrianople, about 82,000; Brussa, 77,000; Kaisarieh, over 72,000; Kerbela, Mosûl and Mecca, each 61,000.

The population is made up of a number of different races; even among the Turks, which predominate, there are hereditary differences which often cause serious dissensions.

Government.—The government of Turkey is an absolute monarchy, and the sultan is the ruler. He is absolute in authority, not responsible to anyone, and his person is inviolate. The succession to the throne is hereditary. It is now and since 1617 has been vested in the family of Othman (or Osman), in the person of its oldest living male member. The sultan is therefore succeeded by his oldest son, provided there are no living uncles nor cousins who are older in the Othman family. The oldest son takes the throne without regard to his mother, provided he sprang from the harem. The harem is a permanent institution of the empire, and all children born in the harem, no matter who their mothers are, whether free women or slaves, are legitimate and of equal lineage. It has been the rule and custom of the sultans of Turkey for many centuries not to contract regular marriages, but to maintain the harem. The inmates of the harem are women who are brought to it by purchase or who come to it by their free will. The greater part of them have heretofore come from places outside of the empire, the majority having come from Circassia. The sultan selects a certain number, generally seven, to be "Ladies of the Palace," who are called "Kadyn." The rest are called "Odalik," as they remain under the "Kadyn" as servants. There is a superintendent of the harem, an aged woman of the palace, who bears the title of "Haznadar-Kadyn." The present reigning sultan (1904) is Abdul-Hamid II., b. 22 Sept. 1842 (15 Shaban 1245). He is the second son of Sultan Abdul Medjah, and succeeded to the throne 31 Aug. 1876, succeeding his brother Sultan Murad V., and he is the 34th in line of the house of Othman, who have ruled over Turkey since the establishment of the Ottoman Empire, in 1299, the first (1299) being Othman. The Koran is the fundamental law of the empire, and all laws are based upon its precepts. While the will of the sultan is supreme and he can execute his orders without responsibility to any authority, he is supposed not to act in opposition to the precepts of the Mohammedan religion as recorded in the 'Book of the Prophet.' Next to the Koran there are the laws of the "Multeka," which are executed by the sultan and are binding upon subjects. These laws are now in the form of a code formed out of the supposed sayings and opinions of the Prophet Mohammed, and some decisions supposed to have been made by his immediate successors. There is another code of laws called the 'Cahon Namek.' These laws were formed by Sultan Solyman the Magnificent, and are held to be of obedience, but merely as human authority. The legislative and executive and religious authority of the empire are exercised by the sultan, and, under his direction, through his representatives. He exercises the civil authority through an official, acting under him, called Sadr-azam, or grand vizier, and the religious authority through a head of the church called the "Sheik-ul-Islam." Both these

officials are appointed by the sultan, but the Sheik-ul-Islam has the nominal concurrence or confirmation of the "Uleman," a body of officials presided over by the Sheik-ul-Islam. The "Mufti" or interpreters of the Koran are connected with the Ulema. This body, called the "Ulema," is made up of all the judges, religious authorities, interpreters and teachers of literature and science that may be summoned by the Mufti. Effendi, bey, or pasha is the title of the officials. Some of the Ottoman administrations have at various times had constitutions drawn up modeled after some of the states of Western Europe, but so far they have not resulted in much reformation. The first constitution was proclaimed 18 Feb. 1856, and another, a decree of Sultan Abdul-Hamed II., was in Nov. 1876. There is now a kind of cabinet or privy council called the Medjliss-i-Hass, to assist the grand vizier as head representative of the sultan and under him of the government. The official positions in this Medjliss-i-Hass are: Grand vizier, sheik-ul-islam, minister of justice, minister of war, minister of marine, president of the council of state, minister of foreign affairs, minister of the interior, minister of finance, minister of public instruction, and minister of commerce and public works. These officials have general charge of the matters coming under the jurisdiction of their respective departments. The Ottoman Empire is divided into smaller or local governments called "vilayets." There is a governor-general at the head of each vilayet, who is called the "vali." He is the direct representative of the sultan in the vilayet, and has a council to assist him in the government. The vilayets are subdivided into provinces called "sanjaks," districts called "kazas," subdistricts called "nahiès," and communities or "kariès." The sanjaks, kazas and karies are subjected to inferior authorities known as mutesarifs, kaimakams, mudirs and muctars, and they are under the superintendence and control of the principal governor. During later years some of the divisions of the country, for political reasons, have been changed, especially the vilayets in Macedonia. As results of these modifications six of the sanjaks of the empire are governed now (1904) by mutesarifs, who receive their appointment direct from the sultan and are called mutesarifats. All subjects, no matter how humble their origin, may fill the highest offices in any of these political divisions. As late as 1902 there were decrees published setting forth a plan for the improvement of the government of the provinces of Turkey in Europe. By these decrees the employment of both Christians and Mohammedans was provided for in the judicial tribunals and in the direction and management of the police. Very important measures with regard to public works, public industries and public instruction were included in these decrees, and a kaimakam was appointed in the principal town of each vilayet whose duty it is to cause the administrative business to be regularly transacted and to see that necessary civil tribunals are formed, and that schools are established and maintained where required. Under these decrees the valis received new powers, among them being the authority to inflict punishment for illegal judicial conduct. An inspector-general was made to correspond with the reform commission in Constantinople, and it was made the duty of the commission to report to the grand vizier. The Austro-Hungarian and Russian governments recommended additional measures of reform in February 1903, which included a reorganization in the management of local financial matters, amnesty to political offenders, the employment of expert policemen from other countries in order to secure the better detection and punishment of arnaut malefactors. The Porte accepted the recommendations, but they have not been enforced and no reforms have been effected. In October 1903 Austria-Hungary and Russia agreed upon a new scheme of reformation in the appointment of assessors from the civilians representing both these governments, to accompany and advise the Turkish inspector-general, and also the appointment of a general from a foreign nation to reform and improve the gendarmerie of Macedonia. These officials were appointed. Many other measures were insisted upon which were intended to secure reforms; among them it was required that the bashi-bazouk and other organizations that had been guilty of outrages in the Christian provinces should disband. It was hoped by those who inaugurated these schemes that they might prepare the way for the autonomy of Macedonia.

The sultan's subjects possess the freedom of their persons and are nominally equal before the law. The judicial department is in a sense an adjunct of the executive department, all executive officers being vested with authority to perform duties connected with the administration of justice. The judicial department has three classes of Turks, or they form three sections; those in the service of the cults (imam), the law expounders (mufti) and the judges (kadi). The ideas and practice of justice, both civil and religious, are based on the Koran. The highest court is the court of appeals in Constantinople, with two chambers. There are civil courts, criminal courts and commercial courts. The commercial courts base their decisions on the code of commerce. The criminal courts are formed of a president and two judges, and in some of them two merchant judges sit, who are selected from the colony of foreigners. The lack of system and prevalence of corruption in the judiciary branch of the government have made it necessary to adopt measures called "capitulations." By these decrees it is now provided that foreigners living in Turkey are subject to the laws of their own countries, and for offenses in cases in which Turkish subjects are not concerned are to be tried by a tribunal presided over by their consul. But foreigners who own real estate in the Ottoman Empire are subject to the jurisdiction of the civil courts in all questions concerning their lands. Cases between subjects of foreign governments and Turkish subjects are tried in the courts of the empire, but a representative of the consulate of the foreigner is to be present, to see that the trial is conducted according to law. The execution of the sentence is carried out through the consulate of the country to which the foreign offender belongs. Cases between two subjects of foreign countries are tried in the court of the defendant's consulate.

History.—The language of the Turks shows they are near of kin to those who spoke the Ural-Altaic or Turanian languages, which were in use from the western frontier of China to the Caspian Sea. There are different dialects, the harsh

one of the east and the soft and more melodious dialect of the west, but many of the words, phrases and grammatical forms are similar. A portion of the present Turkish race are descendants of a people who once inhabited the territory west of Lake Baikal. The claim is made that while living near the shores of Baikal Christian missionaries visited them, and in support of this claim is the fact that their ancient alphabet has 14 letters based on the Syriac alphabet. The name "Turks" given to the mighty hordes who dwelt on the steppes of Northern Asia, at the foot of the Altai Mountains, and beyond Persia, is mentioned in history about the middle of the 6th century. They were an aggressive people, seeking existence in lands where others had obtained a sustenance. In about the year 800 they secured possession of a part of the territory now called Armenia, and they named the place Turcomania. They were not content with the fertile acres of Armenia; they continued their wars for extension of territory and enlarged their possessions in Asia, secured territory in Europe and Africa. Some of their power came through the advancement of the Turks in the armies and governments of the Saracens and others. In the 9th century the Turks had extensive control and vast power in the government of Egypt, Palestine and Syria, and from the 10th to the 12th century their power was great in Persia and India. In the 12th century the Turks and their allies of kindred races conquered Western Asia and established an empire. Later this empire was divided on account of internal dissensions, and in the 13th century the Mongols became virtually the owners. The ferocious Mongols and their allies destroyed the power of several of the tribes in Western Africa, only to lose it again. The Turkomans and Seljuks, under the leadership of their emirs, reconquered a part of their former territory, took possession of what is now Asia Minor and divided the country among themselves. Othman or Osman (bone breaker) was one of the Turkoman emirs. His Tartar companions followed his leadership and forced an entrance to Bithynia through the passes of Olympus (1299). The sultan of Iconium was his protector, but the power of the young Othman grew as he received reinforcements from lawless and disaffected adventurers, who were then about as good as the neighboring tribes and races. At the death of his protector, Othman proclaimed himself as sultan, and thus began the Ottoman Empire. (See GOVERNMENT.) Many historians claim that the father of Othman, Er-Toghrul, who died in 1288, paved the way or laid the foundation for the establishment of the government his son founded. Othman was bold and brave, loyal to friends, cruel to foes, and possessed the vices of the conqueror and the virtues of the leader. The history of Turkey proper begins with the reign of Othman. His immediate successor was his son Orcha (Orkhan), who assumed command of the armies at the death of his father, in 1326. He organized the Janizaries, a body of paid infantry, men trained to the use of arms and who seemed to have no fear of foe or danger. By means of his army he gained possession of Asia Minor to the Hellespont (Dardanelles), and by marriage he formed an alliance with the Greek emperor. He also secured the diplomatic friendship of the Genoese, who were then among the commercial rivals of the Mediterranean and Asiatic waters.

A powerful army under Amurath, the son of Orcha, invaded Europe in 1355, and the record of the wars which followed and which were continued for many years on European battlefields is a record of Moslem invasion and at times success, but finally resulted in the victory of the Christians. At times the Moslem armies seemed destined to conquer the whole world. Orcha's son and successor, Amurath I., obtained possession of Adrianople, Macedonia, Albania and Servia. Adrianople was made the capital. Several forces united to defeat him, troops from Hungary, Italy and from the Upper Danube; but the Turks defeated the combined armies at Kossova in 1389. Amurath was assassinated the same day, and his successor was Bajazet, called Ilderim (Lightning). Bajazet, like his predecessors, had a sanguinary but successful reign. In 1413 Mohammed I., the fourth son of Bajazet, ascended the throne. During his reign his grand vizier, Ibrahim, organized a Turkish navy. The rulers who followed continued to advance the interests of the empire, not always by methods which would be considered humane to-day, but by wars and intrigues and acting upon the motto that "might makes right." In 1451 Mohammed II. became sultan. He was then only 26 years of age. On 29 May 1453 he conquered Constantinople, and entered the city with a new title, that of "Conqueror." The city was made the capital of the empire, and has ever since been the official residence of the sultan of Turkey. The castle of the Dardanelles was built by Mohammed II. and a reorganization of the government was made after the plan of the organization of the Persian Empire. He attacked and conquered successively Morea, Servia, Bosnia and Albania. He took from the Venetians Lemnos and Negropont; from the Genoese, Caffa; and, in 1475, made Crimea a dependency of Turkey. Otranto in Naples belonged to Turkey when Mohammed II. died. He died in 1481. His successor lost no territory, and Selim I. (grandson of Mohammed II.) drove the Persians to the valley of the Euphrates and Tigris. In 1517 he added Palestine, Egypt, and Syria to the Ottoman Empire. The Turkish armies were the terror of the world, and the "Conquering Turk" was a power by land and sea. Many of the countries of Europe had been conquered in whole or in part, and all the rulers trembled. Germany was threatened, but the walls of Vienna (1529) checked the advance of Solyman and his army. The north and south coasts of the Mediterranean had been conquered or laid waste, but the nations were aroused and marshaled their forces against the "Turk." Turkey seemed strong, almost invincible, but her weakness was her internal dissensions. The conquered nations, although subdued, were nevertheless rebellious. From the death of Solyman II., in 1566, the power of Turkey began to decline. The race of rulers degenerated as a whole, not even retaining the military courage and daring which had made the bandit chief, Othman, a sultan. From 1300 to 1566 Turkey was one of the great powers of the world and the first military power in Europe. After the reign of Solyman the "Magnificent" (1566) the incompetency and indifference of a majority of the sultans rendered it necessary for the grand viziers and other officers to assume more control. Some of the grand viziers may be said to have practically upheld the state for decades; but

the conditions of the world were such that to hold a place among the world powers rapid advancement was necessary, and Turkey could not hold her own with the powers that were making giant strides in all departments of education, and in the arts, industries, and sciences. The people grew sullen, life became insecure, hatred and revenge grew in strength. A hated ruler was likely to be assassinated. Wars still went on. Accounts of the noted battles have been given in articles dealing with the cities or towns. (See LEPANTO.) In 1711 Turkey became involved in a war with Russia on account of the former giving shelter to Charles XII. of Sweden. The years following, until 1874, it might be said that Turkey and Russia were always at war. Mustapha III., who reigned from 1757 to 1774, became alarmed at the growing strength of Russia, and demanded that Catharine II. should remove her army from Poland, but instead Turkey had to yield. Abdul Hamid, who became sultan in 1774, was obliged to renounce all control of Crimea, to cede to Russia the region between the Dnieper and the Bog rivers, and to open the Turkish seas for Russian merchant ships. In 1787 Turkey declared war against Russia, but she suffered defeat except at the battle of Belgrade, when the force under Selim III. was victorious. In 1807 Russia declared war against Turkey, and succeeded in nearly every encounter. The revolt of the Greeks at a time when the Turkish army was engaged in another direction was a severe blow to Turkey. In 1853–4 Russia again declared war; but France, England and Sardinia decided to aid Turkey. This war is known in history as the Crimean war. (See CRIMEA.) It terminated with victory for Turkey; and the treaty of Paris, on 30 March 1856, obliged Russia to make important concessions to her rival empire. In 1875 some of the Turkish provinces began a revolt; Herzegovina took the lead and was soon followed by Servia and Montenegro. But it was not until later that the countries named became free to any extent from Turkish rule. The differences between Turkey and Russia were growing in importance, not only to the two empires but to all Europe. None of the European nations wished to have Russia enlarge her territory or increase her power. Left to themselves, it seemed as if the absorption of Turkey by Russia might be accomplished.

In 1876 the great European powers decided to interfere, and the first reform they asked of Turkey was better treatment of her Christian provinces. Representatives of the six "great powers" met at Constantinople; but Turkey rejected their overtures and so-called interference. Turkey gave her ultimatum on 18 Jan. 1877, and Russia, who announced herself as the defender and protector of the Christian provinces, declared war 21 April 1877. Rumania declared her independence the 22d of May. The Russian success was such that Turkey had to accept her terms, and on 3 March 1878 the treaty of San Stefano was effected. The treaty of Berlin, 13 July 1879, modified in some respects the treaty of San Stefano. The Berlin treaty provided that Montenegro, Rumania and Servia should be independent. Russia obtained Rumanian Bessarabia, but gave Dobrudja, containing 6,102 square miles, to Rumania. A portion of Armenia, including Batoum, was also given to Russia. Bosnia and Herzegovina were given to Austria-Hungary, but Turkey exercises suzerainty over them. Bulgaria north of the Balkans was erected into a principality, still under the protection of Turkey, and Bulgaria south of the Balkans was made an autonomous province called Eastern Rumelia. Other changes, not decided upon at Berlin, but which went into effect in 1877 and succeeding years, were the right to occupy Cyprus, granted to Turkey by England; the transfer by Turkey of Thessaly to Greece; placing Tunis under the protection of France. Eastern Rumelia was annexed to Bulgaria in 1885.

The treatment of the Armenians by the Turks in 1895 not only aroused the indignation of Europe, but of the whole civilized world. Large numbers of Armenians, without regard to age or sex, were massacred at Erzerum, Kharput, Trebizond, Zeitan and other parts of Armenia. The circumstances were most revolting, and the powers entered a protest; but action was delayed at Constantinople so that no real good was then effected. In 1896 a massacre of Armenians in Constantinople resulted in the murder of large numbers of defenseless men, women and little children. The pretext for the massacre was that certain Armenians had attacked the Ottoman bank. Crete manifested her dissatisfaction in 1896 by riots. The Christians of Crete asked to be united with Greece, and in February 1897 Greece sent to the island a naval and military force. On 17 April 1897 Turkey declared war against Greece. After a short campaign Turkey was so successful that Greece asked the intervention of the powers. The terms of the settlement obliged Turkey to restore Thessaly (the seat of the war) to Greece, the latter country to pay a war indemnity of $2,000,000. Crete was placed on the basis of autonomy, but under Turkish suzerainty. The benefit of a provincial autonomy is clearly demonstrated by Lebanon, in Syria, surrounded as it is by provinces less favored in government.

Turkey has long been the most important element in the "Eastern Question" (q.v.). Closely connected as she is with Christian nations, having within her territory many Christian subjects, her manner of dealing with her own people and with her neighbors has so far provoked a number of wars, and the solution of the "Question" seems almost as remote as ever. Macedonia revolted in 1903, but was unsuccessful in securing any decided change. Armenia is in a state of great unrest, and the whole empire, while apathetic as regards industrial and commercial progress, seems to be enjoying the peace of a volcano nearing eruption. The name "The Sick Man of the East" has been given to the Ottoman Empire in allusion to its decline or decaying condition. The Russian Czar, Nicholas I., was the first to use the name, in a discussion with the British ambassador, Seymour (about 1852). The same Russian emperor, before beginning the Crimean war, proposed the dismemberment of the Turkish Empire by Russia and England.

Bibliography.— Baker, 'Turkey in Europe'; Blunt, 'People of Turkey'; Bérard, 'La Turquie et l'Hellénesme Contemporain'; Bernard, 'Turquie d'Europe et Turquie d'Asie'; Clark, 'The Races of European Turkey'; Cuinet, 'La Turquie d'Asie'; 'Geographie Administrative'; Creasy, 'History of the Ottoman Turks'; Davey, 'The Sultan and His Subjects'; Fazy, 'Les Tures d'Aujourd'hui'; Freeman, 'The Ottoman Power in Europe'; Georgiades, 'La Turquie Actuelle'; Garnett, 'The Women of Turkey and

their Folklore'; Hecquard, 'La Turquie sous Abdoul Hamid II.'; Isambert, 'Grèce et Turquie d'Europe'; Knight, 'Where Three Empires Meet'; Keene, 'The Turks in India'; Poole, 'Story of Turkey'; Latimer, 'Russia and Turkey in the Nineteenth Century'; Lejean, 'Ethnographie de la Turquie d'Europe'; Lozer, 'Turkish Armenia and Asia Minor'; Lunay, 'Chez les Grecs de Turquie'; Macoll, 'The Sultan and the Powers'; Percy, 'The Highlands of Asiatic Turkey'; Reclus, 'Geographie Universelle'; Ramsay, 'Historical Geography of Asia Minor'; Salmone, 'The Fall and Resurrection of Turkey'; Steevens, 'With the Conquering Turk'; Seignobos, 'Political History of Europe since 1814'; Von Hummer-Purgstall, 'Geschichte des Osmanischen Reiches,' 10 vols.; Zinkeisen, 'Geschichte des Osmanischen Reiches in Europa,' 7 vols.; Warner, 'In the Levant.'

B. Ellen Burke,
Editorial Staff, 'Encyclopedia Americana.'

Turkey, a river in northeastern Iowa. It flows southeast and enters the Mississippi in the southeastern part of Clayton County. The Galena limestone is found in the Turkey River valley. The river is about 100 miles long.

Turkey, an American game-bird of the pheasant family and genus *Meleagris*. widely known both wild and domesticated. The common northern wild turkey (*M. gallapavo*) formerly inhabited almost all parts of the United States and southern Canada and southward through the greater part of Mexico; it is now numerous, however, only in thickly wooded mountainous and inaccessible regions. It is a very beautiful bird of trim form and stately main and the cock is colored with golden bronze hues, marked and varied by the blue and black lustre of the plumage. A peculiar tuft of hair-like feathers is suspended from the breast, and the head and neck are furnished with wattles and erectile structures, which under excitement exhibit varying tints and hues. The wild turkey is a bird of the forests, where it lives in small flocks which enter clearings only to feed. They are eminently terrestrial, being swift of foot and they scratch on the ground for the nuts, seeds, insects, etc., upon which they feed or pick berries and small fruits from the bushes. When pursued they prefer to run and seek concealment in the underbrush but if forced to fly are strong of wing. At night they roost in the tops of trees and are always keen-sensed and alert. Like most of the pheasants turkeys are more or less polygamous and in the spring the cocks fight viciously for the possession of mates, before whom they show off in the pompous and ludicrous manner so well known in the domesticated bird. A simple nest on the ground, often by the side of a log, is made and lined with dry leaves; in it from one to three females deposit from 10 to 25 eggs, which are dirty white with reddish spots.

Although formerly so abundant and so tame that the early settlers found the neighboring forests almost as convenient as poultry yards, few persons have now the opportunity of shooting a wild turkey, but any such are epochs in the life of a sportsman, for success requires both skill and knowledge. The method most in vogue is for the concealed hunter to attract the birds to him by imitating their call upon a turkey whistle and to shoot the wary birds as they appear. This method is most effective when the hen's call is employed to attract the cocks. They are also hunted with dogs or even stalked.

The domesticated turkey is derived from the Mexican variety, examples of which were carried to Europe in the early part of the 16th century; but it is possible that the strain may have been mixed in England with northern birds. The latter were partially domesticated by the Indians and New England settlers. The domesticated turkey has lost the grace, agility and brilliancy of color of its progenitor, but in other respects has been but little modified. In habits it is indeed still a half wild creature. In the four centuries of its domestication it has remained remarkably stable and except in color no distinct varieties have been produced. Of its habits, appearance and merits nothing need be said.

The beautiful Central American ocellated turkey (*M. ocellata*) is of rather less size than the common turkey, but more brilliantly colored. This species wants the tuft of hairy feathers seen on the breast of the other and derives its specific name from the presence of brilliant eye-like spots on the tail-coverts.

Consult: Sandys, 'Upland Game Birds' (New York 1902); Baird, Brewer & Ridgway, 'North American Land Birds,' Vol. III. (Cambridge 1872); Darwin, 'Animals and Plants under Domestication,' Vol. I. (New York 1868).

Turkey-buzzard, the best-known and most widely distributed of the American vultures (*Cathartidæ*), its range including the greater part of the United States and the entire South American Continent. It is about 2½ feet long, its wings may extend 6 feet, and it weighs about 6 pounds. The plumage is blackish brown, the naked head is red and the bill white; the scientific name is *Cathartes aura.* From about the latitude of Philadelphia northward the turkey-buzzard is migratory and visits New England only rarely, but throughout the remainder of its range it is chiefly resident. Like other vultures its principal food is carrion, but insects and small living mammals, reptiles and the young and eggs of birds are also eaten. Especially in the South, where it consorts with the black vulture, this species performs a most valuable service as a scavenger. To a considerable extent gregarious, the common attraction is generally the presence of some carcass. Notwithstanding the generally repulsive habits of the turkey-buzzard its powers of flight must claim admiration; seemingly for hours at a time it soars in widening circles, often at a great height, and scans the earth in quest of a meal. The actions of any one bird when food is discovered attract others, and these again others, until many have gathered to the feast, often from great distances. In this manner all of the buzzards over a large area keep in touch with one another and any decomposing carcass is certain to be discovered and removed. Turkey-buzzards nest in pairs or in small communities, building their rude nests on the ground often by the side of a fallen log, or an old rotting tree stub or in a cave among rocks and always in out-of-the-way places in thick woods. The eggs are one or two in number, nearly three inches long and dirty white spotted with various browns and lavender. The nestling birds are thickly covered with white down.

Turkey-corn. See Squirrel-corn.

Turkey, Orders and Decorations of. See ORDERS, ROYAL.

Turkey-red, a color, originally produced on cotton cloth, rivaling the rich red obtained in dyeing wool and more permanent than any other red dye. It is obtained by the use of madder, in conjunction with an intricate and tedious method of dyeing, the three most essential processes of which are the impregnation of the cloth with an oleaginous soap, the mordanting with alumina, and the dyeing with madder. The theory of these several processes is little understood and for that reason the long and repetitious method has never been successfully shortened. The art is supposed to have originated in India and from there was introduced into Turkey, where Adrianople was long the seat of the industry. From this fact comes the name Adrianople-red, by which the color is sometimes known. In the middle of the 18th century Great Britain and Western Europe began the manufacture of turkey-red fabrics and in portions of France, in Glasgow and in Lancashire the industry has assumed importance. Besides being used in the solid color, turkey-red cloths are used in the manufacture of cloth "prints," the red being bleached from the design wherever it is desired to leave white or impose another color.

Turkey-stone, or **Turkey Oil-stone,** a very fine-grained silicious rock, highly prized as a honestone. It comes from Asia Minor.

Turkish Bath, a popular form of hot steam or hot air bath in which the bather after being subjected for some little time to a considerable temperature, is vigorously rubbed down, and is then conducted through a series of cooling chambers till he has regained his normal temperature. The secretions and accretions are completely removed from the skin, which is left free to performs its functions.

Turkish Language and Literature. See TURKEY.

Turkomans, tėr'kō-manz, a group of nomadic Tartar tribes occupying the regions to the east and south of the Caspian Sea. Other related tribes, known as the western Turkomans, are settled further to the west and south, in Syria and Asia Minor.

Tur'meric, the tuberous rhizomes of a plant (*Curcuma longa*) of the ginger family. It is a perennial, native to southern Asia, and cultivated largely both there and in the Malayan Islands. The ovate, central tubers are known as "bulbs," or "round turmeric"; the more cylindrical, lateral ones, as "fingers" or "long turmeric." They are all hard and tough, brownish or yellowish-green outside, and orange-hued, resinous and aromatic internally. The aromatic taste and odor are due to an oil called turmerol, or turmeric-oil. Turmeric, ground into a powder, has been valued for centuries in Asia, and especially in India, as a carminative, and aromatic-stimulant drug, an infusion of it in milk being a common remedy for colds; it is also applied externally as a cooling lotion for diseases of the skin and eyes. Its chief utility in India, however, is as a condiment and dye (q.v.), it being the important yellow ingredient of curries and curry-powder, and yielding a beautiful, but fugacious yellow dye. White paper soaked with a tincture of turmeric changes to a reddish-brown color, drying out to violet when an alkali is added to it, so that a test-paper for alkalies is prepared from it called turmeric or curcuma paper. The plant itself has long, narrow sheathing leaves on the flower-stalk, which ends in a leafy spike of yellow flowers. A species of *Canna*, cultivated in Sierra Leone, is the African turmeric, used by the natives there as a dye-plant. Blood-root (*Sanguinaria canadensis*) and the yellow-root (*Hydrastis canadensis*) are also called turmeric and turmeric-root. The turmeric-tree is *Acronychia baueri*, of southeastern Australia, the bright-yellow inner bark of which yields a dye.

Turner, tėr'nėr, **Charles Tennyson,** English poet: brother of Alfred Tennyson. See TENNYSON-TURNER, CHARLES.

Turner, Charles Yardley, American artist: b. Baltimore, Md., 25 Nov. 1850. He studied in Paris with Laurens, Munkacsy, and Bonnat. He is a member of the National Academy of Design; American Water Color Society; American Etching Club; and National Society of Mural Painters. At the Buffalo Pan-American Exposition (1901) he was director of color.

Turner, Henry McNeal, American bishop of the African Methodist Episcopal Church: b. Newberry Court House, S. C., 1 Feb. 1834. He educated himself by dint of earnest perseverance and was licensed to preach by the Methodist Church South in 1853. In 1858 he transferred his membership to the African Methodist Church and studied the classics, Hebrew and divinity at Trinity College. He was the first colored chaplain ever commissioned, and after being mustered out in 1868 was then commissioned chaplain of the regular army. He sat in the Georgia legislature in 1868 and 1870, and in 1880 became a bishop in his church. He has organized four annual conferences in Africa, is a prominent advocate of the return of his race to Africa, and has published 'Methodist Polity'; etc.

Turner, Joseph Mallord William, English painter: b. London 23 April 1775; d. Chelsea 19 Dec. 1851. He entered the Royal Academy as a student, and after remaining there in that capacity for five years, and working actively at his profession for another five, during which periods he sent to the exhibition no less than 59 pictures, he was elected, in 1799, an associate of the Royal Academy. In the two following years he exhibited 14 pictures, and in 1802 was elected an academician. Till this date he had chiefly been known as a landscape-painter in water-colors, but thenceforth he turned his attention to oil-painting, and in the ensuing half century produced at the Academy exhibitions upward of 200 pictures. In 1807 he was elected professor of perspective in the Royal Academy, and the following year appeared his 'Liber Studiorum' or 'Book of Studies,' which Charles Turner, Lupton, and others engraved. Other works by him which were engraved are his illustrations of Lord Byron's and Sir Walter Scott's poems; Rogers' 'Italy' and 'Poems'; 'The Rivers of England'; 'The Rivers of France,' and 'Scenery of the Southern Coast.' To enumerate the different paintings of Turner would be impossible. They have established him as the greatest of English landscape-painters, and earned for him the appellation of the "English Claude," to whom indeed many of his admirers pronounce him superior. Among his more famous pictures reference may

specially be made to his 'Kilchurn Castle,' 'Loch Awe'; 'The Tenth Plague of Egypt'; 'The Wreck of the Minotaur'; 'Calais Pier'; 'The Fighting Téméraire Tugged to her Last Berth'; 'The Grand Canal, Venice'; 'Dido and Æneas'; 'The Golden Bough'; 'Modern Italy'; 'The Fall of Carthage,' and 'The Building of Carthage.' In private life Turner was a man rather of reserved and unsocial manners, but the reports circulated of his parsimony and sullenness appear to have been quite untrue, and many instances are recorded of his liberal and generous acts both as a man and an artist. He never was married. By his will he bequeathed all his pictures, of which he had about 60 in his possession at his death, along with an immense number of engravings and sketches, to the nation, on condition of a suitable building being erected within ten years for their reception. They have been placed in the Turner Gallery, occupying two rooms in the National Gallery. He also intended a large part of his fortune to be devoted to the formation of a benevolent fund for artists, but this intention, though clearly enough expressed, was set aside by the lawyers because of the somewhat confused nature of his will. Turner owes his immense reputation largely to the brilliant advocacy of John Ruskin (q.v.) in his 'Modern Painters.' Mr. Ruskin divides his career, from an artistic point of view, into five periods: a period of development, three periods of greatness, and one of decline. His developmental period ended with 1880. It includes these, among other works: 'A View of the Archbishop's Palace at Lambeth' (1790); 'The Pantheon the Morning after the Fire' (1792). His first style lasted from about the beginning of the century to about 1820, and in it he "labored as a student imitating various old masters." The principal pictures of this period are: 'The Fifth Plague of Egypt' (1800); 'The Tenth Plague of Egypt' (1802); 'Kilchurn Castle' (1802); 'Calais Pier' (1803); 'The Shipwreck' (1805); and 'Dido building Carthage' (1815). The 'Liber Studiorum' also belongs to the period of his first style. His second style prevailed, according to Ruskin, from about 1820 to about 1835, and was characterized by freedom from mere imitation and by striving for beautiful, ideal effects. Among the works which illustrate it are the following: 'The Bay of Baiæ,' with 'Apollo and the Sibyl' (1823); 'Cologne' (1826); 'Dido directing the Equipment of the Fleet' (1828); and 'Ulysses deriding Polyphemus' (1829). During his third period, 1835–45, he produced many splendid works of marked individuality, but shallow critics began to ridicule him and his work, and full appreciation of his genius did not come till Ruskin entered the lists in 1843. The following represent his third style: 'Mercury and Argus' (1836); 'Snowstorm, Avalanche, and Inundation' (1837); 'Modern Italy' (1838); 'Ancient Italy' (1838); 'The Fighting Téméraire Tugged to her Last Berth' (1839), his best known picture; 'The Campo Santo' (1842); 'The Snowstorm' (1842); 'Peace — Burial at Sea' (1842); 'The Approach to Venice' (1843); and 'Rain, Steam, and Speed' (1844). The remaining years of his life were years of decline, but his genius still asserted itself fitfully. Consult: Ruskin, 'Modern Painters,' biographies by Thornbury (1862); Hamerton (1879); Monkhouse (1882); Armstrong, 'J. W. Turner'; Wornum, 'Turner Gallery' (1850); Wedmore, 'Turner and Ruskin'; Cook's Handbook to the National Gallery. See also the article PAINTING for an indication of his position in the history of painting.

Turner, Ross Sterling, American artist: b. Westport, Essex County, N. Y., 29 June 1847. He adopted the profession of an artist in 1873, and has studied in Germany and Italy. Among his notable pictures are: 'A Small Court, Mexico'; 'El Jardin Modesto'; and 'A Bermuda Wedding.' He is the writer of 'Water Colors'; 'Art for the Eye — School Room Decorations'; etc.

Turner, Sharon, English historian: b. London 24 Sept. 1768; d. there 13 Feb. 1847. After a successful career as a London attorney he retired from practice in 1829 and devoted himself to literary pursuits. He is best known by his 'History of the Anglo-Saxons' (1799–1805; 7th ed. 1852), long a standard authority. His other works include: 'History of England during the Middle Ages' (1814–23; 7th ed. 1853); 'Modern History of England,' comprising 'The Reign of Henry VIII.' (1826); and 'The Reigns of Edward VI., Mary and Elizabeth' (1829); 'Sacred History of the World' (1832); etc.

Turner, Thomas, American naval officer: b. Washington, D. C., 23 Dec. 1808; d. Glen Mills, Pa., 24 March 1883. He entered the navy in 1825, served on the Columbia, flagship of the East India squadron, in 1838–41, and participated in the destruction of the Malay pirate towns Mucke and Quallat Rattoo, Sumatra, in 1839. He was commander of the Fredonia in the Gulf squadron in 1847, commanded the Reefer in the assault upon Tuspan in April 1847, and in 1855 was promoted commander. In 1858–60 he was in command of the Saratoga in the Home squadron, and in the latter year captured the ships Miramon and Marquis de Habana, which were being used by the Mexican revolutionary party to blockade the port of Vera Cruz. At the outbreak of the Civil War he was assigned to command New Ironsides in the South Atlantic squadron, was promoted commodore in 1862, and took an important part in the assaults on the forts of Charleston, S. C., in 1863. He became rear-admiral in 1868, commanded the Pacific squadron in 1868–70, and in the year last named was retired, after 45 years of active service.

Turner, Sir William, English anatomist: b. Lancaster 1832. He received his general education in private schools, and began the study of medicine in Saint Bartholomew's Hospital, graduating with distinction in the University of London in 1857. He became a member of the Royal College of Surgeons in 1853, and in the following year was appointed demonstrator in anatomy in the University of Edinburgh. In 1867 he succeeded John Goodsir as professor of anatomy. This post he resigned in 1903 when he was elected principal of the university. Since 1873 he has represented his university on the General Medical Council, of which he became president in 1898. He presided over the meeting of the British Association at Bradford in 1900, and delivered an address on the progress of the cell-theory in biology. He has examined in anatomy on behalf of the universities of Ox-

ford, London, and Durham, and has lectured before the Royal College of Surgeons. He was one of the founders, and is joint-editor of the 'Journal of Anatomy and Physiology,' and has contributed many papers to the transactions of learned societies. He has published 'An Introduction to Human Anatomy' (1875); 'Lectures on the Comparative Anatomy of the Placenta' (1876); and an 'Atlas of Human Anatomy and Physiology.'

Turners Falls, Mass., village in Franklin County, on the Connecticut River, and on the New York, N. H. & H., and the Boston & M. (Fitchburg) R.R.'s; about 35 miles north of Springfield, and three miles northeast of Greenfield, the county-seat. The village is in an agricultural section, and has considerable manufacturing interests. The long bend here in the river is cut off by a canal three miles long, which with three falls, furnish extensive water power. The chief manufactures are cutlery, paper, leather, foundry and machine shop products, and cotton goods. The village has a high school, public and parish schools, and a public library. There are two banks, the national has a capital of $100,000, and the savings bank has (1903) deposits amounting to $1,231,000.

Turners Falls is the largest village in the town of Montague (q.v.). Pop. (included in that of the town), (1890) 6,296; (1900) 6,150.

Turner's Gap, Battle of. See South Mountain, Battles of.

Turner's Rebellion. See United States, Wars of the.

Turney, tėr'nĭ, **Peter,** American jurist, son of Hopkins Lacey Turney (q.v.): b. Jasper, Tenn., 22 Sept. 1827; d. Winchester, Ky., 19 Oct. 1903. He was admitted to the bar in 1848, practised law at Winchester until the secession of the Southern States which he actively promoted and then entered the Confederate army, in which he served through the war. He resumed his practice at Winchester after the war, was a justice of the supreme court of the State in 1870–86, chief justice in 1886–93, and in 1893–7 served as governor.

Turnip, a popular name for two closely related biennial herbs of the order *Cruciferæ*. The common turnip (*Brassica rapa*) has a flattened white-fleshed, tuberous root crowned by a compact tuft of thin green hairy leaves from the centre of which, during the second season, a flower-stem rises about 18 inches and bears numerous yellow flowers. The Swedish turnip, rutabaga or baga (*B. campestris*), has a more globular yellow-fleshed root with a more or less distinct leafy neck and glaucous bluish hairless cabbage-like leaves. The flowers are also yellow. The former has also a tap-root with few fibres; the latter has a large number of fibrous roots not only from the main tap-root but from the base of the tuberous part. Neither of these species is definitely known in the wild state, but they are supposed to be natives of eastern Europe or adjacent parts of Asia. They have been cultivated for centuries as food for man and beast, the common turnip for early use in spring and autumn and the rutabaga more as a winter vegetable or stock food. In many places they have run wild and are occasionally known as charlock. When wild they soon lose the tuberous root.

Except in season of sowing, the cultivation of both species is similar. The common turnip is a quick-growing plant which is usually sown as soon as the soil can be worked in the spring or during midsummer. The first sowing produces roots for late spring and early summer use; the last, for autumn consumption. The rutabaga is generally grown as a full season crop, the seed being sown in late spring. It is much richer in flavor than the common turnip. Like other root crops both these plants succeed best upon deep, rich, well-drained light loamy soils free from stones and other obstructions. The seed is sown in drills about 18 inches apart and the plants thinned to stand about 8 inches asunder. The late crop is often sown broadcast, particularly where beef cattle are kept, since the animals may be turned upon the field to browse after the larger roots have been gathered for storing or sale. For success in such practice, however, the supply of moisture in the ground must be abundant, and the soil must be in the highest possible state of tilth before the sowing of the seed because no cultivation can be given during the growing season. When sown in drills clean cultivation must be given until the leaves meet between the rows and completely shade the ground. Under favorable conditions and good cultivation the yield has exceeded 1,000 bushels to the acre, but under ordinary management half this amount is nearer the average. The early crop is often sold in bunches; the late, by measure. The only insects that are occasionally troublesome are the maggot and the flea-beetle. The former may be avoided by judicious rotation, turnips never being planted oftener than once in three years upon land which has been occupied by a cruciferous crop. The flea-beetles may be repelled by tobacco dust, Bordeaux mixture, etc.

Turnpike, a gate that may be set across a road, and is watched by a person appointed for the purpose, in order to stop carriages, carts, wagons, etc., and sometimes travelers, till toll is paid, for the cost and upkeep of the road. Such roads are called turnpike-roads, or simply turnpikes, and formerly were very numerous in Great Britain, but latterly tolls on roads have been almost entirely abolished. See Roads and Highways.

Turnpike Geranium. See Goosefoot.

Turn'spit, a small dog, somewhat like a dachshund, used in old times, in the kitchens of great houses, to turn the spits or jacks upon which meat was roasted before an open fire, the dog traveling in a small treadmill geared to the spit. The breed is now practically extinct.

Turnstone. See Brant-bird.

Tur'pentine, a resinous juice extracted from several trees belonging to the genus *Pinus*. The common American turpentine of commerce comes from the *Pinus palustris*, which grows abundantly in the Southern States. To obtain the oil of turpentine the juice is distilled, usually with water. Turpentine oils from different sources exhibit differences in their physical, more especially in optical, properties. Their specific gravity varies from 0.86 to 0.88. They all contain hydrocarbons of the general formula $nC_{10}H_{16}$, called terebenthenes. Turpentine oils are decomposed by chlorine, with the production of hydrochloric acid and carbon; they are rapidly oxidized by strong nitric acid, with evolu-

tion of heat and light; with more dilute nitric acid they yield a number of oxidized products. Oil or spirit of turpentine, often called simply turpentine, and also "turps," is employed pretty extensively in medicine, both internally and externally, and it is also widely used in the preparation of paints and varnishes.

The Box Method.— Prior to 1901, turpentine gathering, as conducted in the United States, was needlessly destructive of the forests and needlessly wasteful of the product. The method, under the box system universally employed, was to chop in the base of the tree itself a cup-like cavity, the sole purpose of which is to receive the resin which flows from a scarified face of the trunk above it. The box itself does not add to the flow of turpentine; on the contrary, experiment has proved that it diminishes the flow. It is an unnecessary wound driven into the body of the tree at its most vital spot, both weakening its vigor and lessening its power to support the strain of the wind. At the same time it opens the trunk to disease and provides a storehouse of combustibles against the coming of the forest's great enemy — fire. A forest which has been heavily turpentined by this method has before it only decay and death. Until recently the destructive methods in use have been regarded with entire indifference in the regions affected. This has been due to the low valuation of timber throughout the turpentine belt, and to the popular belief that the pine forests of the Southern States were inexhaustible.

The Cup System.— In 1901 Dr. Charles H. Herty, of the Bureau of Forestry, after numerous experiments, discovered a new way of extracting turpentine by using earthen pails or cups, not unlike the method of obtaining maple sap. The discovery has resulted in a complete change of methods by turpentine operators all over the South. In a bulletin published in 1902 by the Bureau of Forestry the claim was made that the experiments with the new cup and gutter system of turpentining had resulted in an increase over the old boxing system of 23 per cent in the amount of the product extracted. This figure was raised in 1903 to more than 36 per cent. The economic saving of this new discovery is enormous. It not only causes a great increase in the amount of turpentine produced, but it is a most important factor in saving the pine forests of the South. Trees from which turpentine has been extracted by the old method soon die from the wounds inflicted on them. The cup and gutter system, on the other hand, is not fatal to the life of the tree, and does very little damage to the timber.

The experiments during 1903 have abundantly justified the claim made that the box is an "unnecessary wound," for the cup system has proved efficient in the hands of the regular turpentine labor, while the increased profits under this improved system are sufficient to warrant its adoption by any turpentine operator, regardless of all questions connected with the future of the naval-stores industry. For statistics and other information concerning the turpentine industry, see the article NAVAL STORES.

Turpentine Oil, the volatile oil or spirit obtained by distilling crude turpentine, the latter being obtained from coniferous trees by incision through the bark or wood. When crude turpentine is distilled there results resin, a solid, and the oil of turpentine, a liquid, which when pure is clear and colorless. It consists chiefly of an essential hydrocarbon oil ($C_{10}H_{16}$), and the resin, colophony. It is possessed of a penetrating, peculiar odor and a pungent, bitterish taste. The various oils display marked diversities in physical properties according to their sources. They are insoluble in water, slightly soluble in aqueous alcohol, and miscible in all proportions with absolute alcohol, ether, and carbon disulphide. They are solvents for iodine, sulphur, phosphorus, resins, and fixed oils. The two principal varieties are derived from the sap of the *Pinus maritima,* or the French maritime pine, and from the long-leafed pine of the Southern States of the United States. The former has a specific gravity of 0.864, boils at 161°, and turns the plane of polarization to the left; the latter has the same specific gravity and boiling point, but turns the plane of polarization to the right. Both oils absorb oxygen from the air, and acquire powerful oxidizing properties from the probable formation of an organic peroxide ($C_{10}H_{14}O_4$). Turpentine absorbs chlorine with such energy as sometimes to set it on fire. Turpentine oil is of great importance in the arts, and is especially employed for giving consistency to oil paints and varnishes, conferring on them drying properties. In pharmacy, in small doses it is absorbed and acts as a stimulant, antispasmodic, and astringent. It produces diuresis, and communicates to the urine passed a smell like that of violets. It can arrest hemorrhage in the capillary vessels. It is generally administered as an enema to destroy tænis, ascarides, etc., in the intestines. Applied externally, it is a powerful rubefacient. Chian turpentine, the product of the terebinth tree, has latterly been successfully employed in cancer.

Turpentine State, a popular nickname applied to North Carolina, which annually sends vast quantities of turpentine to market.

Turpentine Vine. See PISTACHIA.

Turpin, tėr'pĭn (Fr. tür-păń), or **Tylpi'nus,** French prelate: d. 2 Sept. 800. He was archbishop of Rheims, and reputed author of a Latin narrative of Charlemagne's wars against the Saracens. There are indications that the work was written in the 12th century, perhaps by Pope Calixtus II. There are editions by Ciampi (1822) and Reiffenberg (1836). Consult Paris, 'De Pseudo-Turpino' (1865).

Turpin, Richard (known as "DICK TURPIN"), English highwayman: b. Hempstead, Essex. He began life as a butcher's apprentice, was detected in cattle-stealing, fled and joined a band of thieves, with whom he engaged in various acts of depredation and brutal crime. He was captured and hanged for murder. His lawless daring made his name a byword, but he has also been decked in the colors of heroism through the ascription to him of generous qualities which there is no evidence to show that he possessed. He is the hero of Ainsworth's 'Rookwood.'

Turquois, tėr-koiz', a mineral whose name (often spelled "turquoise") alludes to its coming into the European market through Turkey. It is a hydrous phosphate of aluminum, containing a small amount of copper, to which its color is due. It has been a favorite gem in the Orient, from the earliest times, appearing in Egyptian

jewelry of extreme antiquity. Turquois does not crystallize, but forms little veins and nodules in a trachytic igneous rock. Its hardness is 6, its specific gravity from 2.6 to 2.8, lustre somewhat waxy, and its color varies from dull green to beautiful pale blue. In modern jewelry, only the fine "robin's-egg" blue stones are prized; these occasionally turn green because of the gradual drying out of the water which they contain; heating or exposure to the weather always produces this change. The chief turquois mines, near Nishapur, in Persia, have been worked for many centuries; it has also come from the Sinaitic peninsula, which was probably the ancient Egyptian source. The Persian yield has been failing recently, under crude and primitive methods of working; but a number of American localities have been discovered which are now furnishing a large part of the world's supply. All these mines were formerly worked by Indian or Aztec peoples, some of them very extensively, though only with fire and stone tools, which latter are always present. In some cases, traditions still linger among the Indians, and the stone is held sacred to Montezuma and his people. It figures largely in the Spanish records of the conquest of Mexico, and was in part the highly prized "chalchihuitl" of the Mexicans; though in central and southern Mexico this stone was not turquois but green jade. The chief locality is near Los Cerillos, New Mexico; it is also mined at several other points in New Mexico, Arizona, Nevada, and California. A substance often used in place of true turquois is the so-called bone-turquois or odontolite, which is fossil bone colored blue by phosphate of iron. It is easily distinguished under the microscope by its structure, and by its not yielding a blue color with hydrochloric acid and ammonia. Turquois in the natural rock has recently been very extensively cut into gem stones and sold under the name of "turquois matrix."

Turret, in architecture, a kind of small tower. Turrets are chiefly of two kinds, such as rise immediately from the ground, as staircase turrets, and such as are formed on the upper part of a building by being carried up higher than the rest.

Turret Ship. See NAVAL ARCHITECTURE; WARSHIP.

Turtle-dove. See DOVE.

Turtle Tribe. See UNAMI.

Turtles, Tortoises and **Terrapins,** members of the reptilian order *Testudinata* or *Chelonia* (q.v.). To all of the marine and some of the fresh-water species, especially those of large size, the name "turtle" is applied; most of the smaller pond and marsh dwellers are "water-tortoises," a few being designated as "terrapins," while the terrestrial ones, whatever their size, are properly "land-tortoises." About 300 living species, most of them inhabitants of fresh waters, have been described, but the group has steadily declined since Eocene times, and many ancient families are entirely unrepresented in the modern fauna. Tortoises are especially numerous in warm climates, and none extend into the Arctic regions. The marine forms are pelagic and wide-ranging. The various members of this group exhibit considerable diversity in habits and structure, and have been arranged (see CHELONIA) in four sub-orders and numerous families, of which three sub-orders and seven families are represented in the North American fauna.

Of the sub-order *Athecæ* and family *Dermatochelydidæ* the huge leather-turtle (q.v.), the largest of all modern turtles, occasionally appears on our coast. The *Trionychoidea* with the single family *Trionychidæ,* or soft-shelled turtles, are found in the fresh waters of Africa, Asia, and North America. They have the plastron and carapace incomplete and covered by a leathery skin; the neck is very long and flexible, and though folding vertically cannot be retracted entirely within the shell; the head is small and elongated with a slender snout, at the tip of which are the nostrils; the feet are broadly webbed, with long straight claws on some of the toes. *Amyda mutica* has the upper jaw serrate and the carapace without tubercles. It is found in the region of the Great Lakes and the Ohio River. *Aspidonectes spinifer* has the cutting edge of the upper jaw smooth and the margin of the carapace with tubercles. It is abundant throughout the upper Mississippi Valley and particularly in the sluggish streams emptying into the Great Lakes. Closely related species are found southward. The soft-shell turtles are strictly aquatic, leaving the water habitually only in the spring, when about 50 spherical hard-shelled white eggs are deposited in an excavation above the level of the water. They spend much time buried in the mud at the bottom, either entirely concealed or with the head protruding from a hole. They breathe by raising the nostrils to the surface, or, if in water too deep, by means of a thick growth of vascular papillæ in the pharynx over which a current of fresh water from the nostrils continually passes. Strictly carnivorous, they feed upon all kinds of fish, frogs, mussels, snails, and insects which come within reach of their ravenous jaws and which they seize with remarkable suddenness. They are powerful swimmers.

The order *Pleurodira* includes three families of recent and several of extinct turtles, the former being confined to the fresh waters of South America, Africa, and Australia. The tartaruga (q.v.), of the Amazon is of great commercial importance. Unlike most turtles of this group they are said to be largely vegetarian, which probably accounts for the great value placed upon their flesh and fats. During the months of September and October vast numbers leave the water at about midnight to deposit their eggs in holes on the higher ground. Two related genera are found in Africa. The family *Chelydidæ* is confined to South America and Australia. The matamata (*Chelys matamata*) is common in Cayenne. Its length when fully grown is about three feet. It is remarkable in many ways; its snout is prolonged as in *Aspidonectes* and the head and neck are covered with tufts of cutaneous outgrowths which probably assist in the concealment of the animal in the thick aquatic vegetation among which it lives. It is carnivorous.

To the *Cryptodira* belong the great majority of living turtles and tortoises. This sub-order includes 10 or 12 families, 7 of which have recent representatives. The *Cheloniidæ* includes the sea-turtles, in which the limbs are flat, scaly, inflexible paddles and the heads quite incapable of retraction within the shell. Only four genera and about seven species are known, all widely distributed. The three Atlantic species

1. Leather-back Turtle. 2. Hawksbill, or Tortoise-shell Turtle. 3. Long-necked Turtle. 4. Matamata. 5. Elephant Land tortoise. 6. Wood-tortoise. 7. Snapping-turtle.

all occur on our shores more or less frequently. The best-known one is the green turtle, whose flesh is so highly esteemed in soups, etc. This species (*Chelone midas*) is the largest of sea-turtles, and reaches in some cases a weight exceeding 1,000 pounds. It occurs in all parts of the world when the water is not very cold, but most numerously about tropical archipelagoes. As with the other large sea-turtles, the most numerous catch is made when the females come on shore at egg-laying time, on moonlight nights in summer. Their retreat is cut off and the turtle turned on its back. When once in this position these turtles are unable to right themselves. They can endure many weeks without food and water, and hence can be transported great distances on seas in the hold of ships. Before the days of refrigerated meat they served as a welcome diet for sailors; and on some of the Pacific islands these and other large turtles were wholly exterminated by reckless slaughter. The green turtles feed on the roots of the eel-grass, and, betrayed by the floating tops of the grass, are sometimes taken in nets while feeding. The principal catch for the American market is now made in the neighborhood of the Florida reefs, where it forms a regular business with many boatmen. Their catch is largely made by spearing.

Another large and valuable turtle is the hawksbill (q.v.), which furnishes tortoise-shell (q.v.). A third species is the loggerhead (*Thalassochelys caretta*), which is much more frequently taken on the coast of the Middle and New England States than either of the others. It may be distinguished from the green turtle by the thin non-imbricated plates of the carapace, by having the central scale on the top of the head surrounded by a circle of more than 12 small scales, while the green turtle has 7; and by having 2, instead of 1, claws on the feet. This species reaches a large size, up to 500 pounds, and is carnivorous. It has no commercial value, but is sometimes sold as the green turtle.

A strictly American family (*Chelydridæ*) is that of the snapping-turtles (q.v.), including two well-known species of some commercial importance.

Numerous species of small or medium-sized pond, swamp, and land tortoises belong to the families *Kinosternidæ* and *Emydidæ*. Of the first the well-known musk-turtle or stink-pot of boys (*Aromachelys ordoratus*), found in every pond in the eastern States, is an example. The diamond-back (q.v.) (*Malaclemmys centrata*) of the Atlantic salt-marshes, the red-bellied terrapin (*Pseudemys rubriventris*), the painted turtle (*Chrysemys picta*) and the speckled tortoise (*Clemmys guttotus*), three common pond-turtles of the East, the last two being familiar to every fisherman, *Clemmys muhlenbergi*, a less common species distinguished by its dull brown shell and a yellow blotch on each side of the neck, and found along meadow streams, and the map-turtle (*Graptemys geographicus*), chiefly of the Mississippi Valley, and distinguished by the yellow streaks and irregular lines which everywhere mark the shell and skin, all belong to the *Emydidæ*, which also includes the familiar land tortoise (q.v.), or box tortoise (*Terrapene carolina*) and numerous other species.

Of the true land tortoises (q.v.) (*Testudinidæ*), the gopher turtle (*Gopherus polyphemus*) of the Southern States, the European land tortoise (*Testudo græca*) and the gigantic Gallapagos tortoises (*Testudo*) may be mentioned. See LAND TORTOISE.

Besides the articles in this work on particular kinds of turtles consult: Holbrook, 'North American Herpetology' (Philadelphia 1842); Agassiz, 'Contributions to the Natural History of the United States,' Vols. I. and II. (Boston 1857); Boulenger, 'Catalogue Chelonians British Museum' (London 1889); Hoffman, in Brown's 'Thierreichs' (Leipsic 1890); Taylor, 'Box Tortoises of N. A.,' Proceedings U. S. N. M., (Washington 1895); Gadow, 'Cambridge Natural History,' Vol. VIII. (London 1901); True, 'The Useful Aquatic Reptiles and Batrachians of the United States' (Washington 1884).

Tusayan, too-sä-yän', an ancient "province," comprising the tribal range of the Hopi or Moqui Indians of northeastern Arizona, which was first visited by Pedro Tovar and Juan de Padilla, of the expedition of Coronado, in the summer of 1540. It comprised seven villages or pueblos, probably all of which have since been abandoned and new ones built on near-by sites. Between the year named and 1583 two of the villages became depopulated, for in the latter year Antonio de Espejo visited the province of "Mohoce," consisting of the five villages of Shumopovi, Mashongnovi, Walpi, Oraibi and Awatobi, all but the last of which (which was destroyed about the year 1700) are still names of their present-day towns. In addition there are Shipaulovi, Sichumovi, and Hano, which have been established in comparatively recent times, the last by a colony of Tanoan Indians from the Rio Grande in New Mexico. The Hopi Indians are peaceable, derive their subsistence through cultivation of the sandy soil, and making excellent basketry and pottery. They still perform many aboriginal rites and ceremonies, the most celebrated of which is their Snake Dance, in which live rattlesnakes and other serpents are used. Their villages are all situated on lofty mesas, and their houses are generally similar to those of the other Pueblo Indians (q.v.). The Spaniards established missions among them as early as 1629, but they never took kindly to Christianization, and in 1680 murdered their Spanish priests. Henceforward little effort was made to convert them, but in recent years schools have been established in their midst by the U. S. Indian Bureau, and an effort made to teach them the white man's ways, sometimes force being used to overcome their conservatism. The Hopi are kind, hospitable, and industrious, and have been regarded by ethnologists as the most primitive Indians within the United States. They number 1,841. Oraibi is their largest pueblo.

Tuscaloosa, tŭs-ka-loo'sa, Ala., city, county-seat of Tuscaloosa County; on the Black Warrior River, and on the Alabama Great Southern Railroad; about 52 miles southwest of Birmingham, and 90 northwest of Montgomery. It was formerly the capital of the State. It is in an agricultural region in which are grown large quantities of cotton. Extensive coal fields are in the vicinity. The chief manufacturing establishments are cotton gins, cotton compresses, flour mills, machine shops, and creameries. Coal mining and stock-raising contribute to the prosperity of the city. The principal public buildings are the court-house, the Alabama Insane Hospi-

tal, the churches, and schools. The educational institutons are Oak City Academy (Baptist), and Stillman Institute (Presbyterian), both for colored students, University of Alabama (University P. O.), founded in 1831, University High School, a public high school, the Tuscaloosa Female College (M. E.), Central Female College, Institute for Training Colored Ministers (Presbyterian), public elementary schools, and three libraries. There is one private bank and two national banks. The national banks have a combined capital of $170,000. Pop. (1890) 4,215; (1900) 5,094.

Tuscan Order, one of the five Vitruvian orders of Italian architecture, consisting of a modification of the debased Roman Doric. It is peculiar to Italy, and probably originated in Tuscany.

Tuscany, tŭs'kạ-nĭ (Italian, TOSCANA, tōs-kä'nä), Italy, a compartimento, or territorial division, bounded by the divisions of Liguria, Emilia, Marches, Umbria and Rome, and on the west by the Ligurian and Tyrrhenian seas. It consists of the provinces of Arezzo, Florence, Grosseto, Leghorn, Lucca, Massa e Carrara, Pisa and Siena, with a combined area of 9,304 square miles. A number of islands off the coast form the Tuscan Archipelago. The greater part of the surface is mountainous with some enclosed river plains in the interior at Florence and Arezzo. Along the coast are the low, marshy, and unhealthful regions of the Maremme. The principal rivers are the Arno and the Ombrone. The mineral wealth is very extensive, the chief products being iron, copper, mercury, lignite, fine Carrara marble, salt, boracic acid, and sienna earths. The soil in the valleys is fertile, producing wheat, corn, grapes, olives, tobacco, chestnuts, and flowers. The industries are very active and extremely varied. The capital is Florence, and the chief port is Leghorn. For ancient history and archæology see ETRURIA. After the fall of the Western Empire, Tuscany passed through various hands and was finally made a duchy under the Lombards. In the 12th and 13th centuries it was broken up into a number of small republics, among which Florence held the leading place, and later it was reunited under the dukes of Florence, the Medici. After the extinction of the Medici family it passed to the house of Lorraine, under which it remained, with an interruption at the time of Napoleon (see ETRURIA, KINGDOM OF), until it was annexed by Sardinia in 1860. It then became, with Sardinia, a part of the kingdom of Italy.

Tuscarawas, tŭs-kạ-râ'was, a river of northeastern Ohio; it unites with the Mohican and forms the Muskingum (q.v.). It is about 126 miles long. Massillon is the chief town on the river.

Tuscarora, tŭs-kạ-rō'rạ (sig. probably "Indian-hemp gatherers"), a tribe of the Iroquoian stock of North American Indians, which, when first known to the whites, lived on the lower Neuse River and its tributaries, the Trent and the Contentnea, the Tar and Pamlico rivers, comprising the territory south of the present Raleigh, North Carolina. In 1711 they numbered about 4,000, in 15 towns. As the white settlers of North Carolina took from the Indians such lands as they needed, and as they also kidnapped young Indians for purposes of slavery in the West Indies and in the New England colonies, a large portion of the Tuscaroras, in 1711, incensed to bitter hatred toward the whites, formed with neighboring tribes a conspiracy to destroy all the settlers. The war which ensued lasted two years. On 26 March 1713 the hostile Tuscaroras were driven into a fort on Neuse River, where, after a severe conflict, they were defeated with a loss of 800 prisoners. Thus broken in power, the remnant of the hostiles migrated northward and in 1722 were adopted into the League of the Iroquois, or Five Nations, in New York, forming the Sixth Nation. In the American Revolution the Tuscaroras espoused the cause of the colonists. There are now 370 in Lewiston, New York, and 379 on the Six Nations reserve, Grand River, Canada. Neither portion retains distinctive pagan rites, and on the whole they are more progressive than their Indian neighbors.

Tusculum, tŭs'kū-lŭm, Italy, an ancient city of Latium, 15 miles south of Rome in the Alban Hills. Tradition has it that Tusculum was founded by Telegonus, son of Odysseus and Circe. Subsequently its relations with Rome were cordial, and bestowed upon it the right of citizenship. In the Middle Ages it became the seat of a powerful family of counts. In the 12th century it was destroyed by the Romans, whereupon the inhabitants built a new town in the vicinity — Frascati. Its beautiful location attracted many wealthy Romans, who established villas in the district. Distinguished among its residents were Lucius Crassus, the orator; Pompey, Hortensius, Lucullus, Scarus, Brutus, Cæsar and Cicero. The *Tusculanæ Disputationes* were written here. An ancient amphitheatre, theatre, and fragments of the city walls belonging to the ancient city, have been excavated.

Tuscumbia, tŭs-kŭm'bĭ-ạ, Ala., city, county-seat of Colbert County; on the Tennessee River, and on the Southern, the Northern Alabama, and the Louisville & N. R.R.'s; about 174 miles northwest of Montgomery, and four miles below Florence, which is on the opposite side of the river. It was settled in 1812 and was incorporated in 1818. Tuscumbia is in a beautiful valley surrounded by hilly, almost mountainous land; the soil is fertile, the rainfall medium and distributed throughout the year, and the temperature of the climate is also favorable to agriculture and fruit-raising. The chief manufactories are railroad shops, agricultural-implement works, cotton gins, and flour and feed mills. The Sheffield (q.v.) furnaces contribute to the prosperity of the city. The principal public buildings are the Masonic Temple, which was used in the Civil War as a hospital for the wounded of both armies. There are five churches. The educational institutions are two high schools, one for white students and one for colored; Deshler Female Institute, founded in 1870; several private schools and public graded schools. There is one bank with a capital of $100,000. The government is vested in a mayor and four councilmen. Pop. (1890) 2,491; (1900) 2,348.

OSCAR G. SIMPSON,
Editor 'Tuscumbia Dispatch.'

Tusk-shell. See DENTALIUM.

Tuskegee, tŭs-kē'gē, Ala., city, county-seat of Macon County; on the Tuskegee Railroad, a branch of the Western Railway of Alabama; 45 miles northeast of Montgomery. It was first settled in 1780 by Indian traders, was incorporated as a borough in 1800, and as a city in 1820. It is the centre of a fertile cotton-raising region; contains a cottonseed-oil mill, two cotton ginneries, brick kilns and saw-mills; and has two banks with a combined capital of $100,000. It is also a pleasant winter resort. It is widely known as the seat of the Tuskegee Normal and Industrial Institute (q.v.), established in 1881, and is also the seat of the Alabama Conference Female College, Methodist, established in 1855. The city government is vested in a mayor and a council of six members. Pop. (1890) 1,803; (1900) 2,170.

CHAS. W. HARE,
Attorney-at-Law, Tuskegee, Ala.

Tuskegee Normal and Industrial Institute, an institution for the education of the negro, located at Tuskegee, Ala. It was established in 1881 as the Tuskegee State Normal School, receiving a State appropriation of $2,000; the first session was held in a small shanty church with one teacher; during this first session the present site, then consisting of 100 acres, was purchased through Northern aid; in 1883 the State appropriation was increased to $3,000; and in 1893 the institution was chartered under its present name. In 1899 the National Government granted to the school 25,000 acres of mineral land, the proceeds from which added to the endowment fund. The aim of the school is to give its students thorough moral, literary and industrial training, thus fitting them to take active and useful part in the life of any community, and to become leaders of their own race aided in bringing about better material and moral conditions. The organization of the Institute includes the Academic Department, the Phelps Hall Bible Training School, the Department of Mechanical Industries, and the Agricultural Department. The work of the literary and industrial departments is closely correlated, and students cannot obtain training in one line without the other. The instruction in the academic department is of elementary and secondary grade. There is also a training school including a kindergarten. The courses include English, history, geography (in elementary grades), mathematics, nature study, chemistry and physics (in the secondary grades), physiology, and Bible study; there is also a normal course, extending through the last two years, the second year's work being elective; this includes psychology, school organization and administration, history of education, and methods and teaching; practice work is provided for in the model school, and in neighboring village and rural schools. Instruction is also given in music. The Bible Training School is designed for the education of ministers and for the training of missionary workers, Sunday school teachers, etc. The course is three years in length and includes a thorough study of the Bible, Biblical theology, pastoral theology, and sociology. The instruction in the Academic Department is given in two sessions, the day school and the night school, the latter is intended for those who cannot afford to pay the small tuition of the day school, and pupils are allowed to work out at least all of their board for the first six months in the industrial or agricultural departments; the day school students are also given opportunity to work out a part of their board; the work must be satisfactory to be accepted. In the Department of Mechanical Industries a large variety of trades are taught; the aim of the department is fourfold: (1) to teach the dignity of labor; (2) to teach the trades thoroughly; (3) to furnish trained industrial leaders; (4) to assist students in paying their expenses. Instruction and work is given to the men in architectural and mechanical drawing, blacksmithing, brickmaking, carpentry, canning, electrical engineering, foundry work, harness making and carriage trimming, machinery, painting, printing, sawmilling, steam engineering, shoemaking, tinsmithing, tailoring, and wheelwrighting; to the women in plain sewing, dressmaking, millinery, cooking, general domestic science, laundering, mattress making, basketry, and nurse training. The latter is a post-graduate course, and post-graduate work is provided also in some of the other industries for both men and women. The Agricultural Department provides courses in general agriculture, care of animals, and dairying; there are courses for young women in poultry raising, dairying, gardening, and bee-keeping; also post-graduate courses and elementary courses compulsory for two years for students in the academic department. In 1896 the State established an agricultural experiment station in connection with the Tuskegee Institute.

The graduates and students of Tuskegee have had a strong influence in the uplifting of their race; even though many students do not complete the course, their training at Tuskegee both increases their industrial efficiency and raises their moral standards so that they obtain marked success in their various occupations, and win the respect of the white people, as well as of their own race. Many become teachers, often teachers of various industrial arts, agriculture, domestic science, etc.; some are physicians, lawyers, or trained nurses; and many others become efficient, successful farmers, mechanics, or merchants. Their influence is thus gradually lessening the prejudice against negro education, and Tuskegee has gained the respect and often hearty sympathy and co-operation of the white people of the South. The Institute is wholly officered by negroes. (See also NEGRO EDUCATION.) It is situated near the centre of Alabama, on high ground about a mile from the town; the land including the farm belonging to the Institute, consists of 2,631 acres; there are 62 buildings, mostly built by student labor, important among these are Porter Hall, Olivia Davidson Hall, Science Hall, Cassedy Hall, Alabama Hall, Huntington Hall, Rockefeller Hall, Collis P. Huntington Memorial Building, Phelps Hall, Bible Training School Building, Trades' Building, Dorothy Hall, and the Carnegie Library. The property is valued at $525,000 (1904); the students in 1904 numbered 1,500; the faculty 151. In 1903 a summer school for negro teachers was established.

Tussaud, tü-sō', **Marie Gresholtz** ("MADAME TUSSAUD"), founder of the well known exhibition of wax-work in London: b. Bern, Switzerland, 1760; d. London 16 April 1850. She learned the art of modeling in wax in Paris, where she assisted her uncle Curtius in his 'Cabinet de Cire' in the Palais Royal. For a time she gave

lessons in modeling to Elizabeth, sister of Louis XVI., and in this way became acquainted with the leading personages at court. In 1802 she established herself in London. The collection of over 300 portrait figures (that of Voltaire and others yet on view modeled by Madame Tussaud herself from life) with a remarkable collection of relics, is still one of the interesting features of London, where it is now managed by a company. Consult: Hervé, 'Memoirs of Madame Tussaud' (1878).

Tusser, tŭs'ẽr, **Thomas,** English agricultural writer and poet: b. Rivenhall, near Witham, Essex, about 1524; d. London 3 May 1580. He was a chorister at Saint Paul's and elsewhere, studied at Cambridge, was for ten years retainer and musician to Lord Paget at court, and farmed unsuccessfully in Suffolk and Norfolk. Later he was a singer in Norwich Cathedral, a tax-farmer in Essex, and a servant of Trinity Hall, Cambridge. Tusser of whom Fuller, in enumerating his vocations, says he was "more skilful in all than thriving in any," introduced barley-culture into England, and wrote the famous work 'A Hundredth Good Pointes of Husbandrie' (1557), later (1573) expanded into 'Five Hundreth Pointes of Good Husbandrie,' a series of practical directions on agriculture, written in rude dactylic verse, in which Sir Walter Scott finds he has "frequently attained . . . a sort of homely, pointed, and quaint expression." Many proverbs have been derived from it. There have been many reprints and editions, including that for the English Dialect Society by Payne and Herrtage (1878). The rimes do not lack sound agricultural value, and Tusser has been styled the "British Varro." Consult: Fuller, 'Worthies' (1662); Warton, 'History of English Poetry' (ed. Price 1840).

Tusser, Tussore, or **Tusseh,** the silk spun by the tusser silkworm. See SILKWORM.

Tussila'go. See COLTSFOOT.

Tussock-moth, one of the small grayish or brownish moths of the genus *Halesidota,* or some allied genus, whose cocoons are composed of silk and caterpillar hairs mingled, and are fastened in the interstices of the bark of trees. These moths defoliate trees, and feed upon a wide variety of hard woods. They are, consequently, a constant pest of parks and shade-trees, and measures must be taken to destroy the cocoons in winter, by scraping them off the trees or applying strong insecticides. A European species is a special pest of hop-vines.

Tutelo, too-tā'lō. Strictly the name of a tribe of the former Monacan confederacy of the Siouan stock of North American Indians, who, when first known to the whites, in 1671, lived on the headwaters of the Dan in southwestern Virginia. The name, however, being a contraction of the Iroquoian designation (Todirich-roone) of all the Siouan tribes of the South Atlantic coast, was employed by the Iroquois in a more comprehensive sense. By 1675 the Tutelo tribe had drifted to the Roanoke River in southern Virginia, and by 1701 had occupied several parts of upper North Carolina, owing to pressure of the Iroquois from the north. Soon after 1711, with the remnants of the various tribes of Virginia and the adjacent parts of North Carolina, they were gathered at Fort Christanna, in the present Brunswick County, Virginia, where they became generally known as Christanna or Saponi Indians, although the latter name was strictly applicable to a single though cognate tribe. At Fort Christanna the tribes were thrown in contact with unprincipled whites, whose influence had the usual effect of rapidly degrading the Indians, although Gov. Spotswood made an attempt to educate their children. The Iroquois raids continued, notwithstanding the proximity of the garrison, but these practically came to an end with the Albany treaty of 1722. Dissatisfied with their white neighbors, and particularly with the hanging of one of their chiefs, the Tutelo, Saponi, and other confederated tribes, resolved to follow the example of the Tuscaroras (q.v.) by placing themselves under the protection of the Iroquois. Consequently, about 1740, they began a gradual migration northward, settling first at Shamokin village, Pennsylvania, where Sunbury now stands. By 1748 they had settled at Skogari, in the present Columbia county, Pennsylvania, where they were described by Zeisberger as "a degenerate remnant of thieves and drunkards." In 1753 the Tutelo and their allies were adopted by the Cayugas, becoming a part of the Six Nations. As the Iroquois espoused the cause of the British in the American Revolution, half of them, including most of the Cayugas, were driven into Canada, where they were settled on the Grand River reserve. The Tutelo went with them, erecting their village on "Tutelo Heights," a suburb of Brantford. About 1830 they still numbered some 200, but a smallpox epidemic in 1832 greatly reduced, and another in 1848 almost exterminated, the tribe. In 1871 the last full-blood survivor passed away. See Hale in 'Proceedings of the American Philosophical Society,' (Vol. XXI., Philadelphia 1883–4); Mooney, 'Siouan Tribes of the East' (Washington 1894).

Tuticorin, too-tē-kŏr'ĭn, India, a seaport in the province of Madras, situated on the northwest shore of the Gulf of Manar, 70 miles northeast of Cape Comorin. It is the terminus of the South Indian railroad, has pearl fisheries, and considerable trade. Pop. (1901) 28,048.

Tuttiett, tŭt'ĭ-ĕt, **Mary G.** ("MAXWELL GREY"), English novelist: b. Newport, Isle of Wight. Her first work was 'The Broken Tryst' (1879); but 'The Silence of Dean Maitland' (1886) at once brought her before the English and American public as one of the most notable of the later novelists, and is the book by which she will be longest remembered. Later works include: 'The Reproach of Annesley' (1889); 'In the Heart of the Storm' (1891); 'Sweethearts and Friends' (1897); 'The House of Hidden Treasure' (1898); 'Ribstone Pippins' (1898); 'The Forest Chapel' (1899); 'The World's Mercy' (1900); 'Four Leaved Clover' (1901); etc.

Tuttle, tŭt'l, **Daniel Sylvester,** American Protestant Episcopal bishop: b. Windham, Greene County, N. Y., 26 Jan. 1837. He was graduated from Columbia in 1857 and from the General Theological Seminary in 1862; was admitted to deacon's orders in 1862 and to the priesthood the next year. He was rector of Zion Church, Morris, N. Y., 1863–7, and in the year last named was consecrated missionary bishop of Montana, Utah, and Idaho. He was translated to the diocese of Missouri in 1886, and in September 1903 succeeded Rt. Rev.

Thomas March Clark as presiding bishop of the Protestant Episcopal Church.

Tuttle, George Washington, American merchant: d. Bath, N. Y., 3 April 1903. He was one of the original seven students who founded the Psi Upsilon Fraternity at Union College in 1833. He was a merchant in New York in 1848–68, and retired from business in 1878.

Tuttle, Herbert, American historian: b. Bennington, Vt., 29 Nov. 1846; d. Ithaca, N. Y., 21 June 1894. He was graduated at the University of Vermont in 1869, and soon after entered the field of journalism. His first newspaper work was in connection with the Boston *Daily Advertiser*. In 1872 he went abroad and for some years resided in Germany, where he became a correspondent of the London *Daily News*, the Glasgow *Herald*, and the New York *Tribune*. Here he devoted much time also to the study of German political history and international law, and upon his return to America was appointed resident lecturer in the department of political science at the University of Michigan, and in 1882 became professor of international law and the theory of politics at Cornell University. In 1890 he was appointed to the chair of modern European history at Cornell. He published: 'German Political Leaders' (1876); 'History of Prussia to the Accession of Frederick the Great' (1884); and 'History of Prussia under Frederick the Great' (1888).

Tu'tor, in Scotch law, the guardian of a boy or girl while a minor. A father is tutor to his children by common law. Failing him, there may be three kinds of tutors — tutors nominate, tutors-at-law, or tutor-dative; the division being borrowed from the Roman law. A tutor-nominate can only be appointed by the father, either under his will or by some writing clearly indicative of his wish. He is not generally bound to find security for his intromission with the estate of his pupil, but the court of session may ordain him to do so. A tutor-at-law is appointed by the court when there is no tutor-nominate, or when he dies, or does not accept. The nearest relation by the father is usually appointed if 25 years old and able to give security. But the tutor-at-law has only the custody of the pupil's estate, his person being entrusted to his mother, or, failing her, to his nearest relative on her side. A tutor-dative is named by the crown when there is no tutor-nominate, nor at-law. The office is in all cases an unpaid one, and the tutor is bound to make inventories and to keep accounts. For certain important acts — selling land, for example — he requires the sanction of the Court of Session. In American colleges a tutor is an advanced student who teaches other pupils in branches in which they are deficient.

Tutuila (too-twē'lä) **Islands,** a group of the Samoan Islands (q.v.).

Tututunne ("people close to the water"). The name (1) of a gens or village on the north bank of Rogue River, above its mouth, in Oregon, and extended to include (2) a number of gentes or villages of the Athapascan stock of North American Indians in the same general locality. Little is known of the primitive customs of the tribe, but they formerly practised polygamy, and widows were buried alive in the graves of their deceased husbands. After hostility toward the government they were removed in 1856 to the Siletz reservation, where they have since resided. At the date mentioned they were officially reported to number 1,311, but they are now reduced to fewer than 100.

Tuy, twē, Philippines, pueblo, province of Batangas, Luzon, on Mantenlupā River; 28 miles northwest of the pueblo of Batangas. It is surrounded by a cattle raising and agricultural region; and is connected with Balayan and the coast highway by road, and with the province of Cavité by a trail leading over the Sierra de Tagaytay. Pop. 10,150.

Tvashtri, twäsh'trĭ, or **Tvashtar,** in the Rigveda of the Hindus, the mythological creator, shaper, or divine artisan, later classed among the Adityas or gods of heavenly light. He is the divinity who creates the gods, human-kind, and animals, and rules their destinies. His daughter Saranyu, whom he married to Vivasant, was the mother of Yama and Yami, the primeval pair. The sun as the primary source of life and all blessings is supposed to be the mythological origin of Tvashtri.

Tver, tvär, Russia, (1) Capital of the government of that name, on the Volga, 96 miles northwest of Moscow. It contains a Kremlin or fortress, surrounded by a wall, outside of the main town, has fine promenades, spacious open squares, handsome buildings, royal palace, 34 churches, two monasteries, convent, Protestant and Catholic churches, etc. The cathedral of the Transfiguration is a remarkable structure with five cupolas, and fine mural paintings by Platon (18th century). Further a monument to Catharine II., theatre, various schools, seminaries and military academy. There are numerous manufactories, including cotton mills, iron-foundries, starch factories, etc. A brisk trade is carried on with Moscow and Saint Petersburg. There are spacious docks and machine-shops. Pop. (1897) 53,477. (2) The government contains an area of 25,794 square miles. The surface is mountainous, declining into a plain at the north. Forests are extensive and the fields yield rye, barley, hemp and flax. Pop. (1897) 1,812,825.

Twachtman, twät'man, **John Henry,** American painter: b. Cincinnati 4 Aug. 1853; d. Greenwich, Conn., 8 Aug. 1903. He came under the influence of Frank Duveneck in 1875, just as the latter was fresh from the studio of Piloty at Munich, and was making a great impression in New York by his brilliant and rapid execution. Twachtman, at his suggestion, studied from 1875 to 1878 at Munich under Loefftz and subsequently at Paris. He eventually settled at Greenwich, Conn., developing an original line of artistic production, in which he tempered the crudeness of impressionism by a certain refined and tender sensibility, and manifested a fine sense of color in its most delicate shades and subtile combinations. He has been called a "minor poet of the brush." Without being a rich colorist, or a bold innovator he produced pictures fresh, original and finding their way to the heart by their pathetic simplicity, the truthfulness of their detail and the absence of all flourish and self-consciousness in the apparent ease and directness of their technique. His typical theme was a winter landscape, a stream of water rushing down a ravine, between thin edges of ice, and bare bushes on each side; a

white house with dull colored roof, under a turbid gray sky; or the coolness, moisture and silence of a snow scene, whose atmosphere he suggested with truly marvelous felicity. If he was not fully appreciated in his lifetime his paintings will doubtless grow in popular estimation, and win recognition as vital incidents in the history of American art, gaining emphasis also from their personal interest as reflecting the artist's fine nature, his love of beauty in landscape, and his keen observation of the more fleeting and elusive phases of atmospheric change, the more sombre charms of rugged or barren scenery and clouded sky, in the seaboard of the eastern States.

Twat, twät, Sahara, a large group of oases situated to the south of western Algeria in lat. 27° to 29° N., and separated from the Atlas Mountains by the desert of El Erg. It contains several salt lakes, wadies and some artificial irrigation canals, and produces dates, wheat, senna, cotton, etc. The principal caravan routes from Timbuktu to Algeria and eastern Morocco converge at this point, and the trade is very important. The principal single oases are Guarara in the north and Twat proper in the south, the latter having several mosques and a pop. of 6,000.

Tweed, twēd, William Marcy, American politician: b. New York 3 April 1823; d. there 12 April 1878. He was by trade a chairmaker and first gained political foothold through his popularity as foreman of the "Americus" fire-engine company No. 6, known as "Big Six." He was an alderman in New York in 1852–3, United States congressman in 1853–5, chairman of the New York board of supervisors in 1856, school commissioner in 1856–7, deputy street commissioner in 1861–70, and State senator in 1867–71. From his appointment as deputy street commissioner the power of the famous Tammany Ring really dates. He was practically at the head of the department and with his support of unscrupulous political friends his power increased until when elected commissioner of public works in 1870 the "Tweed Ring" controlled practically every department of municipal expenditure. He increased enormously the city pay-roll, giving to political allies high-salaried sinecure positions. His largest scheme for robbing the city treasury was that of the county court-house, begun in 1868 and planned to cost $250,000, but upon which $8,000,000 was reported as expended in 1871, leaving the building uncompleted. The charter of 1870 which placed the power of auditing accounts with certain city offices occupied by Tweed and his friends removed all restraints from the system of plundering devised by the unscrupulous politician, and the amounts appropriated extended into the millions. A secret account of these depredations was kept in the auditor's office and in the winter of 1870–1 the items were copied by a clerk in the office and were printed in the New York *Times* in July 1871, resulting in the downfall of the "ring" in the election of the following November. Tweed was brought to trial in 1873 on a charge of grand larceny and forgery and sentenced to 12 years' imprisonment and a heavy fine. His sentence was reversed in 1875, but he was unable to furnish bail pending certain civil suits brought against him and was committed to jail. He escaped to Spain in 1875 but was brought back to New York on a warship and again committed to the Ludlow Street jail, where he died. Consult Bryce, 'The American Commonwealth' (1888).

Tweed, Scotland, a river rising in Peebleshire at Tweed's Well, and the largest stream of the country. At Coldstream it forms the boundary between England and Scotland, and enters the North Sea at Berwick, after a course of 97 miles. Its chief tributaries are Gala and Ettrick Waters, the Leader, Teviot, Till and Whitadder. The chief towns on its route are Peebles, Melrose, Kelso, Abbotsford, Coldstream, Dryburgh, Norman Castle, etc., many of them rich in historical and literary associations. The river is celebrated for its trout and salmon fisheries.

Twee'dledum, and **Twee'dledee,** a phrase used only in making reference to a distinction between the two. The suggestion is, of course, that the only distinction between the two is in sound, in other words a distinction without a difference. The expression arose in the 18th century, in the course of a dispute between the admirers of Bononcini and those of Handel, as to the respective merits of those musicians. The matter was thus satirized by John Byrom (1692–1763):

> Some say, compared to Bononcini,
> That Mynheer Handel 's but a ninny;
> Others aver that he to Handel
> Is scarcely fit to hold a candle.
> Strange all this difference should be
> 'Twixt tweedledum and tweedledee.

Tweeds, a certain kind of cloth, so called from the fact that its manufacture originated and was long exclusively carried on in towns on the Tweed and its tributaries. It is distinguished by the softness and flexibility of its texture, qualities which result from the manner in which it is made, the yarns not being so finely spun, nor the cloth so closely woven or so thoroughly felted, as is the case with fine English cloths. Tweeds are also well known by their peculiar and endlessly varied patterns and mixtures of colors, produced by weaving with dyed yarns. The manufacture is of comparatively recent origin; but the great demand for the material has led not only to the rapid growth of the manufacture in its original locality, but also to its extension to various other parts of Scotland, and also into England, as well as to the imitation of the material in France and other continental countries.

Twelfth-day, Epiphany (the 6th of January), which is the 12th day from Christmas. This was formerly (as it still is) a day of great festivity, and the evening of the day was the occasion of observing many curious customs. One of the most widespread of these was the baking of a cake (in England called twelfth-cake) with a bean in it, and dividing the cake among the partakers of the feast. Whoever got the piece with the bean in it was regarded as king for the remainder of the day, in France for the whole of the year. This custom is supposed to have been derived from that which prevailed among the Roman children at the end of the Saturnalia, of drawing lots with beans to see who should be king. In Italy it is customary to give presents to children on this day.

Twelfth Night, or What You Will, a comedy by Shakespeare. It was first printed in the folio of 1623. The outlines of the play are presumed to have been drawn directly or otherwise from the Italian of Bandello, and it is not impossible that the dramatist may have been more or less indebted to the English of Barnabe Rich or the French of Belleforest.

Twelve Patriarchs, Gospel of, a work not recognized as in any sense Scriptural or authoritative, but of interest from the standpoint of ecclesiastical history. It was written in the second century after Christ, and purported to relate utterances of the fathers of Israel, foretelling the coming of the Saviour, and discoursing on the results that would flow from that event. The predictions are modeled on those of Jacob, Gen. xlix., when the patriarch blessed his sons, and prophesied the future of them and their descendants, before giving up the ghost.

Twelve Tables, Law of the, the first written code of Roman laws, enacted in statutory form, having been drafted by a commission of ten elected for the purpose, and approved by the popular assembly (451 and 450 B.C.). It appears to have been a compilation of the older laws, founded on custom and precedent, but it formulated personal and property rights in such clear language that the patrician magistrates were no longer able to misinterpret and misapply them with impunity, as in former times. It was regarded by the people much as Americans regard the National Constitution, and Roman school boys learned the Twelve Tables by heart, even as late as the age of Cicero. A great body of rules grew up around the Twelve Tables, and as these called for expert legal interpretation, the study and practice of law gradually developed into a distinct profession. See ROME; DECEMVIRS.

Twice-told Tales, a collection of short stories by Nathaniel Hawthorne, the first series appearing in 1837 and the second in 1847. They took their title from the fact of their previous publication in various annuals and magazines. Told with a felicity and repose of manner that has not been surpassed in our literature, they reveal a power of imagination, a knowledge of the obscurer motives of human nature, and a spiritual insight, which marked a distinct epoch in American literature. The sketch entitled 'A Rill from the Town Pump' is perhaps the most famous in the collection, which contains here and there themes and suggestions that Hawthorne later elaborated in his longer stories; notably, the picture of a beautiful woman wearing an embroidered "A" upon her breast, who afterward appears in 'The Scarlet Letter.'

Twich'ell, Joseph Hopkins, American Congregational clergyman and author: b. Southington, Conn., 1838. He was graduated at Yale in 1859, and served as chaplain during most of the Civil War. In 1865 he accepted a call to the Asylum Hill Congregational Church, Hartford, Conn. His writings include 'John Winthrop' (1891) and 'Some Old Puritan Love Letters' (1893).

Twickenham, twĭk'n-am, England, a town or urban district of Middlesex, on the Thames four miles southwest of London. In the 18th century it was a fashionable resort. Pop. (1901) 20,991.

Twig-girdler; Twig-pruner. See GIRDLER; PRUNER.

Twiggs, twĭgz, **David Emanuel,** American soldier: b Richmond County, Ga., 1790; d. Augusta, Ga., 15 Sept. 1862. He was appointed a captain in the 8th infantry in March 1812, served in the War of 1812, and in 1814 was promoted major. He also fought in the Seminole and Black Hawk wars, and in 1836 reached the rank of colonel. During the Mexican War he rendered important services, and was brevetted brigadier-general for his conduct at Palo Alto and Resaca de la Palma, where he commanded Taylor's right wing. He commanded a division at Monterey, received the brevet of major-general, was for a little while governor of Monterey, and then joined Scott at Vera Cruz. He commanded the Second division in the advance on the City of Mexico; at Cerro Gordo he led the attack, and at Contreras and Churubusco and at the city gates he performed efficient services. In 1861, while in command of the Department of Texas, he unresistingly surrendered to the Confederates the United States property entrusted to his care, and was in consequence dismissed from the army. Entering the service of the Confederacy, he held a brief command in Louisiana, but toward the end of 1861, on account of infirmities of age, he resigned.

Twiggs, Levi, American marine officer, brother of David Emanuel Twiggs: b. Richmond City, Ga., 1793; d. Chapultepec, Mexico, 13 Sept. 1847. He entered the marine corps as second lieutenant in 1813, and was senior officer of marines on the frigate President during her last cruise under Decatur. At the outbreak of the Mexican War he joined the expedition under Gen. Scott, and was killed in the assault upon Chapultepec.

Twilight, daylight which continues after sunset. Twilight is occasioned by the reflection of sunlight from the higher parts of the atmosphere which are still illuminated after the sun has become invisible from ordinary heights. Light is reflected from the upper air till the sun is about 18° below the horizon, but the duration of twilight is manifestly much influenced by the state of the atmosphere as to clouds, etc. In low latitudes, both on account of the quickness with which the sun traverses the 18° below the horizon and because of the transparency of the atmosphere, there is little twilight. On the other hand, in latitudes higher than 43°, twilight at certain times of the year lasts from sunset to sunrise.

Twill, a textile fabric, in which the weft threads do not pass over and under the warp-threads in regular succession, as in common plain weaving, but pass over one and under two, over one and under three, or over one and under eight or ten, according to the kind of twill.

Twin-leaf, an herb (*Jeffersonia diphylla*) of the barberry family, found in the northeastern United States. It has solitary 4-merous white flowers, an inch across, borne on slender scapes, and succeeded by capsular fruits. The radical, long-petioled leaves are peculiar, the cordate blade being divided to the very base, forming two obliquely ovate lobes, entire, or again some-

what lobed, glaucous beneath, and appearing to be twin leaflets. The leaves arise in tufts from a thick, horizontal rootstock, which is somewhat fleshy, and is said to be stimulative and antispasmodic. It has been employed as a remedy for chronic rheumatism.

Twiss, Sir Travers, English jurist: b. London 19 March 1809; d. there 15 Jan. 1897. He was graduated at Oxford, and from 1842 to 1847 was afterward professor of political economy there. In 1852-5 he occupied the chair of international law at King's College, London, and in 1855–70 was regius professor of civil law at Oxford. In 1862 he was made advocate-general of the British admiralty, and in 1867 was knighted and appointed advocate-general to the queen. In 1872 he retired from public office, but was occupied with various state affairs, notably with the drafting of a constitution for the Kongo Free State, for the Belgian government, and in 1884–5 was counsel extraordinary to the British embassy at the Congress of Berlin. His published works include: 'The Oregon Territory: Its History and Discovery' (1846); 'View of the Progress of Political Economy in Europe Since the Sixteenth Century' (1847); 'The Law of Nations' (1861–3); 'Monumenta Juridica: The Black Book of the Admiralty" (1871–6); and 'Belligerent Rights on the High Seas' (1884).

Two Gentlemen of Verona, a comedy by Shakespeare, for the plot of which he was slightly indebted to Bandello's 'Apollonius and Sylla,' Sidney's 'Arcadia' and Montemayor's 'Diana Enamorada.' The play was first printed in 1623. Fleay conjectures that it was produced in 1591, and then included portions by another hand which were afterward cut out, and others by Shakespeare substituted therefor in 1595.

Two Kettle Indians (mistranslation of Oóhenóngpa, lit. "Two-boilings"), one of the seven divisions of the Tetons, who in turn form part of the great Dakota confederacy of the Siouan linguistic stock, the other divisions being the Brulés, Sans Arcs, Blackfeet or Sihasapa, Minniconjou, Oglala, and Hunkpapa. The Tetons took possession of the Black Hills region of North Dakota, which had previously been occupied by the Crow Indians, long before white men came. They were noted for their prowess in war, and have had, in conjunction with other Siouan tribes, numerous conflicts with the whites. The Tetons are now on reservations, as follows: 4,907 Brulé, Lower Brulé, "Northern," Loafer, Two Kettles, and Wazhazhe (Oglala), under Rosebud agency, South Dakota; 467 Lower Brulé under Lower Brulé agency, South Dakota; 2,471 Blackfoot Sioux, Minniconjou, Sans Arcs, and Two Kettles under Cheyenne River agency, South Dakota; 6,608 Oglala under Pine Ridge agency, South Dakota; about 500 Blackfoot Sioux and 500 Hunkpapa under Standing Rock agency, North Dakota. Total Tetons (est.), 15,550.

Two Noble Kinsmen, The, a pathetic drama founded on Chaucer's 'Knighte's Tale,' and first printed in 1634, with the names of Shakespeare and Fletcher on the title-page as authors. That Shakespeare wrote any part of it is not now believed, but Massinger and Rowley are sometimes suggested as collaborators with Fletcher.

Two-penny Act. See Parson's Case.

Two Sicilies, Kingdom of the. See Sicilies, the Two.

Two Thirds Rule, a provision of constitutional and parliamentary law intended to restrain and prevent unjust and inconsiderate action on the part of majorities. It was unknown in the legislative assemblies of ancient Greece and Rome, and has no precedent in the parliamentary history of Great Britain. It may be regarded as American in its origin, and grew out of the jealous vigilance with which the smaller communities included in the Union of States sought to safeguard their political rights. The Constitution of the United States, in conferring on the Senate the power to try impeachments, provided that no conviction should be had by less than a two thirds vote, thus securing to a minority of the States as represented in the Senate, the power to decide the result. The effect of the two thirds provision, in the case of President Andrew Johnson, when tried on articles of impeachment, was to prevent his conviction, the vote being 35 senators for conviction and 19 for acquittal. A change of one vote would have carried conviction, and although public feeling ran high at the time, some senators who voted against the President expressed themselves in subsequent years as gratified with the result. In this case the two thirds rule had exactly the effect intended by the framers of the Constitution. A similar rule regarding trials on impeachment has been adopted in State constitutions. The Constitution of the United States also provides that in the event of a veto by the President of any measure which has passed Congress, an affirmative vote of two thirds shall be necessary to enact the measure into law, and such vote must be taken by yeas and nays, and the names of the persons voting entered on the journal of each house respectively. This rule has also been adopted in the States in which governors possess the power of veto.

The two thirds rule is best known through its adoption and political effect in national conventions of the Democratic party held for the nomination of candidates for President and Vice-President of the United States. It was adopted in the first Democratic National Convention, held in the city of Baltimore, 21 May 1832, when the Committee on Rules reported the following resolution:

"Resolved, that each State shall be entitled, in the nomination to be made of a candidate for the Vice-Presidency, to a number of votes equal to the number to which they will be entitled in the electoral colleges under the new apportionment in voting for President and Vice-President, and that two thirds of the whole number of votes in the convention shall be necessary to constitute a choice."

The rule applied only to the nomination for Vice-President for the reason that there was no difference of view as to the nomination for President, Andrew Jackson being the unanimous choice for the latter office, while there were several candidates for the Vice-Presidency. Martin Van Buren was nominated for Vice-President under the two thirds rule, and was elected to preside over the very body which, by the casting-vote of John C. Calhoun, the

former Vice-President, had rejected his nomination as minister to England.

In the Democratic National Convention of 1836 no reference was made to the two thirds rule. Martin Van Buren was nominated for President without opposition, and Richard M. Johnson received more than a two thirds vote on the first ballot for Vice-President. In 1840 Van Buren and Johnson were again made the candidates of their party, without any necessity of invoking the two thirds rule. They were defeated in the election by Harrison and Tyler.

In the Democratic National Convention of 1844 the two thirds rule was reaffirmed, and made to apply to both President and Vice-President. Van Buren had a majority of votes for the Presidential nomination, but less than two thirds, and he maintained this majority on the first eight ballots. Opposition to him was strong, however, and on the ninth ballot James K. Polk, of Tennessee, who had not received a vote until the eighth ballot, received the entire vote of the convention. He had not even been a candidate for the nomination, and his name had not been put formally before the convention, when its members agreed, in view of the opposition to Van Buren, to make him their nominee. The supporters of Van Buren had apprehended from the first that the adoption of the two thirds rule would involve his defeat, and they opposed it strenuously, the debate on the question lasting a day and a half. Since its adoption in 1844 it has never been disputed in Democratic National Conventions. The convention of 1848, which spent three days in organizing, followed the rule, and it was again reaffirmed in 1852, when Lewis Cass, the leading candidate, was defeated, and Franklin Pierce nominated on the 49th ballot. Cass had a majority on many ballots, but did not command the necessary two thirds, while Pierce did not receive a vote until the 40th ballot. In the convention of 1856 James Buchanan had a majority for President early in the balloting, but did not receive the necessary two thirds until 17 ballots had been taken.

The Democratic National Convention which met in Charleston, S. C., 23 April 1860, was the most exciting ever held in the history of the party, and the enforcement of the two thirds rule in that body may be said to have indirectly brought about the Civil War. The convention was in session for 10 days, and took 57 ballots without making a nomination. Stephen A. Douglas had a majority over all on all ballots, but could not obtain the necessary two thirds. There were 303 votes in the convention, and 202 were necessary to a choice. The convention adjourned to Baltimore, and there the party divided on the issues which brought about the conflict between North and South in the following year. It is generally agreed that Douglas, if nominated at Charleston, and supported by the whole strength of his party, would have been elected, and civil war avoided. That this would probably have been the result is indicated by the fact that Abraham Lincoln, the Republican candidate, received a popular vote of 1,866,152, against a popular Democratic vote of 1,375,157 for Douglas and 847,953 for Breckenridge, indicating a large popular majority, and electoral majority also, for the Democratic candidates, had the party been united. In subsequent Democratic conventions the two thirds rule has been adhered to, but in 1904 its repeal was earnestly urged by many Democratic party leaders and newspapers.

Two Years Before the Mast, a tale of sailor life by Richard Henry Dana, Jr., published in 1840 when the author was a youth just out of college. The book was immediately successful, passed through many editions, was adopted by the British Board of Admiralty for distribution to the navy, and was translated into many Continental languages. In 1869 the author added a supplementary chapter giving an account of a second visit to California, and the subsequent history of many of the persons and vessels mentioned in the original work.

Twombly, Alexander Stevenson, American Congregational clergyman and author: b. Boston 14 March 1832. He was graduated at Yale in 1854, and at the Andover Theological Seminary in 1858. From 1859 to 1872 he held pastorates in Cherry Valley, N. Y., Albany, N. Y., and Stamford, Conn. He also served as chaplain in the Army of the Potomac. In 1896 he retired from his ministerial labors, and devoted himself exclusively to literary work. His publications include: 'The Choir Boy of York Cathedral' (1890); 'Masterpieces of Michelangelo and Milton' (1896); and 'Hawaii and Its People' (1900). He also edited the silver series of 'English Classics.'

Tyan-shan, tē-än'shän', Thian-shan, or Celestial Mountains, Central Asia, a range of mountains running in an easterly direction from the Pamir plateau along the northern boundary of the Tarim basin (East Turkestan) into southern Mongolia. In the east it forms a more or less connected ridge, but toward its western extremity it spreads out, fan-like, into a number of diverging ranges. The highest point, situated near the western end, is Tengri Khan, with an altitude of little over 24,000 feet. See HIMALAYA.

Tybee, tī-bē', an island in Chatham County, Ga.; at the mouth of the Savannah River. It is about six miles long and three miles wide. The waters surrounding it are on the north Tybee Roads, on the east the Atlantic, on the south Tybee Creek, and on the west Lazaretto Creek. The Tybee lighthouse is on the northeastern end; it is 134 feet high; the white dioptric light is 150 feet above the water, and is visible 18 nautical miles. The lighthouse is in lat. 32° 1′ 20″ N., lon. 80° 50′ 31″ W. In the Civil War of 1861–2 it was occupied by the United States forces, under command of Brigadier-General Sherman, 28 Nov. 1861, and batteries were subsequently erected on it and the adjacent islands for the reduction of Fort Pulaski at the mouth of the Savannah River, commanded by Colonel Olmstead of the Confederate army. The bombardment began on the morning of 10 April 1862, from 11 batteries, between 1,500 and 3,000 yards from the fort, mounting 20 guns and 16 mortars; and the fort capitulated at 2 o'clock the next afternoon.

Tycho Brahe, tī'kō brä'ē. See BRAHE, TYCHO.

Tycoon, tī-koon', a Chinese word meaning "great prince." The title was formerly con-

ferred by foreigners on the shogun or commander-in-chief of the Japanese army.

Tyigh. See SHAHAPTIAN INDIANS.

Tyler, tī'lẽr, **Charles Mellen,** American educator: b. Limington, Maine, 1832. He was graduated at Yale in 1855, and later attended the divinity school there. He was ordained in the Congregational Church, and served as captain of volunteers during the Civil War. At its close he became pastor of the South Congregational Church, Chicago, and in 1873 he was called to the First Congregational Church of Ithaca, N. Y., where he remained till 1892, when he resigned to accept the appointment of Sage professor of history and philosophy of religion and Christian ethics at Cornell University. He has published 'Bases of Christian Belief.'

Tyler, Daniel, American soldier: b. Brooklyn, Conn., 7 Jan. 1799; d. New York 30 Nov. 1882. He was graduated from West Point in 1819, served on garrison duty in New England in 1819–24, and was on duty in France in 1828–9 preparing a comprehensive work on 'Manœuvres of Artillery' and securing drawings and designs afterward used in modeling the United States artillery equipment. In 1834 he resigned from the army, and was occupied as a railway constructing engineer and railroad president until the outbreak of the Civil War. He was appointed colonel and later brigadier-general of volunteers in 1861, and was in command of a division at Blackburn's Ford and at the first battle of Bull Run. He was mustered out of service 11 Aug. 1861, but was reappointed brigadier-general of volunteers 13 March 1862, and assigned to the Army of the Mississippi. He participated in the siege of Corinth April–June 1862, and in June 1863 was in command at Harper's Ferry and Maryland Heights. In April 1864 he resigned his commission, and subsequently established large cotton and iron industries in Alabama, was president of the Mobile & Montgomery railroad in 1873–9, and also founded the town of Anniston, Ala.

Tyler, James Gale, American artist: b. Oswego, N. Y., 15 Feb. 1855. He received a public school education and studied painting with A. Cary Smith, a naval architect. His paintings include: 'Abandoning the Jeannette'; 'The Constitution'; 'The Fortunes of War'; 'The Raging Main'; 'Flying from the Alabama'; 'The Flying Dutchman'; 'New England on the Lee'; 'Heaving Over the Deck Load'; 'First American Shipwreck'; 'Cloud Burst'; etc.

Tyler, John, American statesman, tenth President of the United States: b. Greenway, Charles City County, Va., 29 March 1790: d. Richmond, Va., 18 Jan. 1862. Graduated from William and Mary in 1807, he was admitted to the bar in 1809, in 1811 was elected to the Virginia legislature, and for five successive years was re-elected. In 1816 he was sent as representative to Congress to fill a vacancy, and remained there until in 1821, he declined re-election and retired. He was again a prominent member of the legislature of his State in 1823–5, in 1825 was chosen governor, in 1827 succeeded John Randolph as United States senator, and in 1833 was re-elected. He opposed the tariff, the United States bank, and the Force Bill, and favored the South Carolina nullification movement in 1832. The Virginia legislature in February 1836 adopted resolutions instructing senators from that State to vote for the expunging from the journal of the Senate of the resolutions censuring President Jackson (q.v.) for removal of the deposits. Tyler thereupon resigned, having been in the session of 1833–4 a strong supporter of the resolutions introduced by Clay. When Whig candidate for the vice-presidency in 1836, he received the votes of Georgia, Maryland, South Carolina, and Tennessee. He was elected to the legislature in 1838, in 1839 was a Virginia delegate to the national Whig convention which met at Harrisburg, Pa., 4 December, and, having been nominated for the vice-presidency on the ticket with W. H. Harrison (q.v.), was elected in November 1840. President Harrison having died within one month after inauguration, Tyler succeeded to his duties, retained the Harrison cabinet, and published an inaugural address satisfactory to the Whigs. At once, however, he found himself in a struggle with the Whig majority in Congress, which was bound to re-establish a national bank. Two bills to this end he vetoed amid great protest. After his second veto, all of his cabinet but Webster, secretary of state, resigned. At the close of his term, Texas was annexed. Other important measures of his administration were an act for uniformity of proceedings in bankruptcy (1841), and the protective tariff law of 1842. With the end of his administration the alliance between the Whigs and the Tyler Democrats ended. In 1861 he was a member of the peace convention which met at Washington to arrange terms of compromise between the Federal government and the seceded States. In May 1861 he was elected to the provisional Congress of the Confederate States. Elected in the autumn following to the permanent Congress, he died before taking his seat. Consult: Wise, 'Seven Decades of the Union' (1872); Tyler (L. G.), 'Letters and Times of the Tylers' (1884–5). See UNITED STATES, *History.*

Tyler, Lyon Gardiner, American educator: b. Sherwood Forest, Va., 1853. He is the son of President Tyler, and was graduated at the University of Virginia in 1875. In 1877 he became professor of belles-lettres at the College of William and Mary. In 1882–8 he practised law in Richmond, Va., and in 1888 was called to the presidency of the College of William and Mary. He has published: 'The Letters and Times of the Tylers' (1884–5); 'Parties and Patronage in the United States' (1890); and 'The Cradle of the Republic' (1900).

Tyler, Moses Coit, American historian and scholar: b. Griswold, Conn., 2 Aug. 1835; d. Ithaca, N. Y., 28 Dec. 1900. He was graduated from Yale in 1857; later studied theology there and at Andover, and was pastor of the First Congregational Church, Poughkeepsie, N. Y., 1860–2. He was professor of English literature in the University of Michigan, 1867–81; literary editor of the 'Christian Union' in 1872–74, and in 1881 was appointed professor of American history in Cornell University, which position he occupied at the time of his death. He was ordained deacon in the Protestant Episcopal Church in 1881, and priest in

1883. He published: 'The Brawnville Papers' (1809); 'A History of American Literature During the Colonial Period' (1878); 'Manual of English Literature' (1879); 'Life of Patrick Henry' (1887); 'Three Men of Letters' (1894); 'The Literary History of the American Revolution' (1896). His 'History of American Literature' is a work of great literary charm and the most thorough scholarship.

Tyler, Robert Ogden, American soldier: b. Greene County, N. Y., 22 Dec. 1831; d. Boston 1 Dec. 1874. He was graduated at West Point in 1853, and until the outbreak of the Civil War served on frontier duty in the West. In April 1861 he accompanied an expedition for the relief of Fort Sumter. In May he was made assistant quartermaster with the rank of captain, and in September was appointed colonel of the 4th Connecticut volunteers (afterward 1st Connecticut heavy artillery), with which he served until the spring of 1862 in the defenses of Washington. He was conspicuously active in the Peninsula campaign of 1862, participating in its principal battles, and in November was promoted brigadier-general of volunteers. At Fredericksburg he commanded the artillery of the centre ground division. In recognition of his bravery in that action he was brevetted major in the regular army. He distinguished himself in the battles of Chancellorsville, Gettysburg, and Spottsylvania; and was placed in command of the artillery reserve in the Army of the Potomac in November 1863. During the Spottsylvania action he repulsed an attack of Ewell's corps, and for this "gallant conduct and brilliant success" he and his men were publicly thanked by General Meade. He led a brigade at Cold Harbor and there received a wound which maimed him for life and permanently broke his health. At the close of the war he was brevetted major-general in both the volunteer and regular armies.

Tyler, Royall, American jurist and author: b. Boston, Mass., 18 July 1757; d. Brattleboro, Vt., 16 Aug. 1826. He studied law under John Adams, was aide to General Lincoln for a short time in the Revolutionary War and afterward in Shays' Rebellion of 1786. He engaged in law practice at Guilford, Vt., in 1790, became judge of the Vermont supreme court in 1794 and in 1800–6 was chief justice. 'Reports of Cases in the Supreme Court of Vermont' (2 vols., 1809), constitute his only legal publication, but as a dramatist and a humorous writer he attained a considerable reputation. He was one of the first successful American playwrights, his plays including: 'The Contrast' (1786); 'May-Day' (1787); 'The Georgia Spec' (1797); etc. He was a contributor of humorous prose and verse to the leading periodicals of his day, and also published: 'The Algerine Captive' (1797); 'Moral Tales for American Youths' (1800); 'The Yankey in London' (1809); etc.

Tyler, Wat, English social reformer: b. Colchester, Essex; d. London 1381. Nothing is known of his antecedents. There was serious cause for the rebellion which he headed, but like men of other ages he had ideas beyond his time, which he had imbibed from the teaching of a priest, John Ball (q.v.). The insurgents demanded the abolition of serfdom and the poll-tax, a maximum rent of four pence per acre for all lands freed from monastic or monarchial control, the right to buy and sell free from toll all over England, the abolition of the statutes of labor which favored landlords and master-craftsmen at the expense of the workingmen. There seems to have been a general spirit of discontent against all vested interests pervading the lower classes at the accession of Richard II.—city corporations, monastic land-holders, chartered corporations of all sorts. The young king paltered with Tyler and made promises which he afterward broke and the rebel leader was stabbed to death by Walworthe, mayor of London. This insurrection is an interesting incident in the history of the English people and cannot be treated as cavalierly as it used to be until about the middle of the 19th century when English historians began to apply themselves seriously to a study of their country's history as illustrated by original documents. Consult: Trevelyan, 'England in the Age of Wycliffe' (1899); Powell, 'The Rising in East Anglia in 1381' (1896); Réville, 'Soulèvement des travailleurs d'Angleterre en 1381' (1898).

Tyler, William Seymour, American educator and author: b. Harford, Pa., 2 Sept. 1810. He was graduated at Amherst College in 1830, and later studied theology at Andover. In 1847 he was appointed professor of Greek at Amherst. His first published work was entitled 'The Germania and Agricola of Caius Cornelius Tacitus' (1847). It was followed by 'The Histories of Tacitus' (1849). He also published: 'Plato's Apology and Crito' (1860); 'Theology of the Greek Poets' (1867); 'Demosthenes de Corona' (1874); and other works.

Tyler, Texas, city, county-seat of Smith County; on the International & G. N., the Saint Louis S. W. R.R.'s; also a branch to Lufkin in Angelina County; about 95 miles east by south of Dallas. The city is on the highest point of land between the Gulf of Mexico and the Red River, and is in a fertile agricultural region. The chief manufacturing establishments are a box factory having 50 employees; brick works, 30 employees; pottery, 15 employees; canning factory, 100; ice factory, 50; oil mills, 30; "Cotton Belt" railroad shops, 500; general offices, 175; waterworks, 10; electric light plant, 15; telephone works, 30. In all there are about 20 establishments employing 1,500 persons. The shipments are chiefly cotton, corn, fruits, vegetables, hay, and live stock.

There are 10 churches. The educational institutions are Tyler College, Tyler high school, Hubbard, Marsh, and Douglas public schools, two public schools for colored pupils, and East Texas College for colored pupils. The four banks have a combined capital of $600,000, and the average annual amount of business is $50,000,000. The government is vested in a mayor and a council of eight members.

Tyler was settled in 1846, incorporated the same year, and chartered as a city in 1875. Pop. (1890) 6,908; (1900) 8,069, of which about 2,000 are colored.

H. C. Cooke,
Editor 'Daily Democrat-Reporter.'

Tylop'oda, a group of ungulate mammals, containing the camels and llamas, an ancient group characterized especially by the structure

of the feet, in which no traces of the second and fifth toes remain, and the fused metacarpals and metatarsals diverge somewhat at their distal ends. The tread is formed by sole-pads. Singular peculiarities are the elliptical shape of the blood corpuscles, and the character of the rumen-chamber of the stomach. See CAMELIDÆ.

Tylor, tī'lôr, **Edward Burnett,** English anthropologist: b. Camberwell, London, 2 Oct. 1832. He was educated at the Friends' School, Tottenham, and in 1856 accompanied the ethnologist Henry Christy on a scientific journey through Mexico, one result of which was his 'Anahuac, or Mexico and the Mexicans' (1861). He was appointed keeper of the Oxford University Museum in 1883 and became professor of anthropology there in 1895. In 1888 he was Gifford lecturer at Aberdeen, and became president of the Anthropological Society in 1891. He has published in addition to the work already named 'Researches Into the Early History of Mankind' (1865); 'Primitive Culture' (1871; 3d ed. 1891); 'Anthropology' (1881).

Tylosau'rus, a genus of *Mososauri.* See MOSOSAURS.

Tym'panum. See EAR.

Tynan, Katherine. See HINKSON, KATHERINE TYNAN.

Tyndale, tĭn'dal, **Hector,** American soldier: b. Philadelphia 24 March 1821; d. there 19 March 1880. He was engaged in business in his native city during the events just preceding the Civil War. With John Brown and his raid in Virginia he had no connection; but on the last visit of Mrs. Brown to her husband Tyndale consented, at the risk of his life, to act as her escort, a duty which, in the face of insult and violence, he unflinchingly performed. At the outbreak of the War he was in Europe, but at once returned and entered the army as major of the 28th Pennsylvania regiment. In April 1862 he was promoted lieutenant-colonel. At Antietam he commanded a brigade, with which he three times repulsed Confederate assaults. Early in the day he was badly wounded, but remained on the field for hours, being finally carried, with a second wound, to the rear. In November 1862 he was made brigadier-general of volunteers for gallantry in that battle. At Wauhatchie by a bayonet charge he captured a hill which was later named Tyndale's Hill. He also took part in a number of battles around Chattanooga. In 1865 he was brevetted major-general. He was Republican nominee for mayor of Philadelphia in 1868, and was defeated by only 68 votes out of more than 120,000.

Tyndale, William. See TINDALL, WILLIAM.

Tyndall, tĭn'dal, **John,** British physicist: b. Leighlin Bridge, County Carlow, Ireland, 21 Aug. 1820; d. Haslemere, Surrey, 4 Dec. 1893. After secondary schooling, he joined the Ordnance Survey, with which he was connected for five years. He was then engaged in railway work, and in 1847 became a teacher of physics at Queenwood College, Hants. After studying in Berlin, and becoming acquainted with Faraday, Huxley, and other eminent men, he was appointed professor of physics in the Royal Institution, London, with which he continued to be connected till his retirement in 1887. Tyndall did a vast amount of valuable work by original investigation in various branches of science, especially magnetism, electricity, heat, light, and sound, on which he published many papers and several well-known volumes. Among these are: 'Notes of a Course of 9 Lectures on Light' (1870); 'Notes of a Course of 7 Lectures on Electrical Phenomena' (1870); 'Contributions to Molecular Physics in the Domain of Radiant Heat' (1872); 'On the Transmission of Sound by the Atmosphere' (1874); 'Free Molecules and Radiant Heat' ('Philosophical Transactions' (1882). He made, also, studies of glacial phenomena. In 1872–3 he lectured in the United States, and in 1873 published 'Six Lectures on Light, Delivered in America.' He was president of the British Association meeting at Belfast in 1874, and delivered an eloquent address, which, by its materialistic tendency, aroused much controversy. He was the recipient of numerous honors from learned bodies at home and abroad, and many of his books were translated. His ability as a speaker fitted him to be a popular expounder of complicated problems in modern physical science.

Tyne, tīn, England, a northern river formed by the junction of the North and South Tyne, rising in Northumberland and Cumberland counties. As a united river it flows by Newcastle and empties into the North Sea at Tynemouth, after a course of 120 miles. It is partly tidal and belongs to the richest coal region of England. Its principal tributaries are the Derwent, and Team. The chief towns are Corbridge, Ovingham, Newburn, Newcastle, Gateshead, Jarrow, Tynemouth, North and South Shields (qq.v.). It is navigable above Newcastle. Ship-building is important, and the Tyne is celebrated for its boat races. Many manufactures are carried on along its banks. Many improvements have been made by the building of long piers, and the deepening of the channel, giving an impetus to trade.

Tyner, tī'nĕr, **James Noble,** American lawyer: b. Brookville, Ind., 17 Jan. 1826; d. Washington, D. C., 5 Dec. 1904. He was admitted to the bar of Indiana, but later gave up his practice to enter political life. In 1869 he was elected to Congress from Indiana, and served until 1875, when he was appointed postmaster-general. He remained in the cabinet until 1882. In 1889 he was made assistant attorney-general for the post-office department, in which capacity he served until 1893. Four years later he was reappointed to this office, but resigned in 1903.

Tynemouth, tīn'mŭth or tĭn'mŭth, England, a municipal and parliamentary borough in Northumberland, at the mouth of the Tyne on its north bank. It is a favorite watering place, and a fine promenade, park and winter garden have been laid out along the beach. There are many handsome buildings in the town, including Tynemouth Palace and a picturesque old priory. The clearings at the port amount to 1,500,000 tons annually and there is a large export trade in coal and coke. Pop. (1901), including North Shields (q.v.), 51,514.

Tyng, Stephen Higginson, American Protestant Episcopal clergyman: b. Newburyport, Mass., 1 March 1800; d. Irvington, N. Y., 4 Sept. 1885. Graduated from Harvard in 1817,

he was in mercantile pursuits in 1817–19, and in 1819 began the study of theology with Bishop A. V. Griswold (q.v.). He was ordained in 1821, and was minister of St. George's, Georgetown, D. C., in 1821-3 and of Queen Anne's parish, Prince George County, Md., in 1823-9. From 1829 to 1833 he was rector of St. Paul's, Philadelphia, from 1833 to 1845 of the Church of the Epiphany there. He held the rectorship of St. George's, New York, from 1845 until his retirement as pastor emeritus in 1878. He was well known for his eloquence in the pulpit and on the platform. His theology was strongly evangelical, and he was a prominent opponent of ritualism in his church. He also advocated total abstinence, and was otherwise identified with reform interests. Besides editing successively 'The Episcopal Recorder,' 'The Theological Repository,' and 'The Protestant Churchman,' he published several volumes, including collections of sermons and addresses, and 'Recollections of England' (1847); 'Forty Years' Experience in Sunday-Schools' (1860); 'The Prayer Book Illustrated by Scripture' (3 series 1863-7); and 'The Office and Duty of the Christian Pastor' (1874).

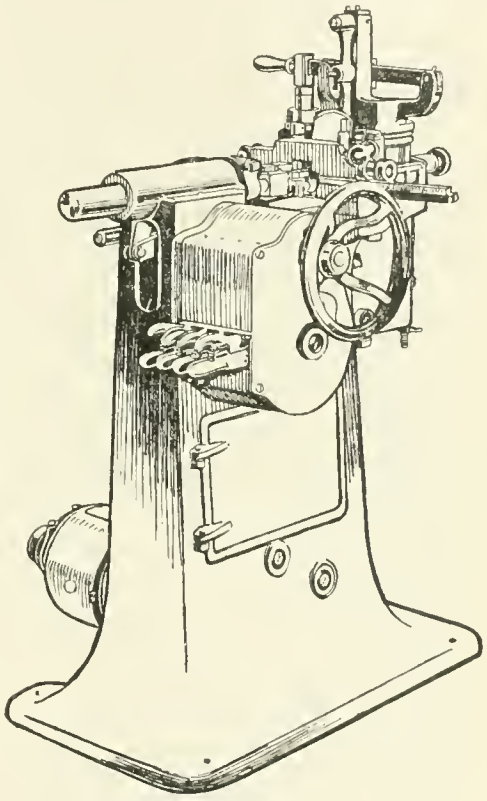
Type. See PRINTING.

Type-casting Machines. Every book, news and job printing office in former years has been absolutely dependent on the type-founder, with his elaborate plant and his established fonts of type in standard and individual copyrighted faces. The waste and wear was large and costly. Office economies compelled the use of fonts even after the faces of many of the types had become too battered for clean printing. To replace the broken and battered type it was necessary to send to the foundry for "sorts" (as the individual types are called) to fill out the fonts, and this was not only expensive but was unsatisfactory, because it interspersed new faces among the old. The invention of the Mergenthaler Linotype machine enabled the printing offices to present absolutely clear-faced, freshly-cast body type for newspapers, books, pamphlets and the like. To a limited degree, also, small headline type for newspapers could be economically set up. But the whole advertising and display field was still left practically to movable type now designed and cast in vast variety. To effect the economy demanded, a small, compact machine, the Sorts Caster, to cast individual type of any face and size at the pleasure and convenience of each office, has been devised, and it is now in successful operation in many newspaper, book, and job printing offices. The inventors of the machine and its accessories are John E. Hanrahan, an experienced type designer and type foundryman; Frank H. Brown, a printer of wide experience, and George A. Boyden, a mechanical engineer. They have taken out numerous patents in the United States and abroad and have applications pending for further improvements.

The Sorts Caster occupies but little space — 4½ feet high by 3½ feet long by 3 feet wide. It is operated by belt and pulley, allows 22, 14 and 9 speeds to the minute and requires ¼ horse-power. Carrying to the full the newly adopted standardization of type, one size of this machine will cast with accuracy type from 6-point up to and including 36-point; and a larger size casts type from 36-point to 72-point.

A very solid cast-iron frame supports the strongly made component parts — an adjustable steel mold to which is fastened the brass matrix of the desired letter; a gas-heated pot of molten type metal; a plunger rod to force accurately the exact amount of molten metal into the mold as the latter is automatically thrust forward into place; and a planer to trim the base of the type and eject it, perfect and complete, along on the delivery rod when mold and melting pot separate.

The base of the mold is stationary and permanently secured to the machine and forms with the ejector rod two sides of the mold. These are so arranged as to receive interchangeable insert mold parts to complete the exact parallelogram required by the particular face and size of the type to be cast. This insert mold part carries the brass matrix in which is cut the face of the type. Each matrix specifies the exact adjustment of blanks which the operator must make to procure the correct width or set-wise size of the character to be cast. There is an insert mold part for each body-wise size.



The Sorts Caster Machine.

A 50-pound font of 12-point type can be cast in nine hours, and a font of 18-point in seven. Fonts of matrices are sold outright; distinctive designs may be cut for individual printers; or fonts may be hired as books are from a circulating library.

R. H. LYMAN,
Editorial Staff of the New York 'World.'

Type-composing Machines. See COMPOSING MACHINES.

Type Founding, the art of casting and finishing the types used for printing. (See PRINTING.) The metal of which types are formed is an alloy of lead and antimony, with generally an admixture of tin. In making types the letter is first cut upon the end of a steel punch. The punch is then driven into a piece of copper, which forms the matrix or bottom of the mold intended to produce the letter. The mold in which the types are cast is composed of two parts. The outer part is made of wood, the inner of steel. At the top it has a hoppermouth, into which the fused type-metal is poured. The matrix is placed at the bottom of the mold, directly under the centre of the orifice, and is held in its position by a spring. Every letter that is cast can be loosened from the matrix only by removing the pressure on the spring. Each letter is cast by itself, the workman having a pot of the melted alloy beside him, from which he takes the necessary quantity with a small ladle. A skilful workman will turn out 500 good letters in an hour. A considerable piece of metal remains attached to the end of the type as it quits the mold, but this is easily broken off. The types are afterward dressed and polished on each side, and a groove or channel is cut in their bottom to make them stand firmly on end. It is essential that each letter be perfectly symmetrical and square; the least inequality of their length would prevent them from making a fair impression. Each letter is finally tied up in lines of convenient length, the proportionate numbers of each variety, small letters, points, large capitals, small capitals, and figures, being selected when the font of type is ready for delivery to the printer.

Type Metal. See TYPE FOUNDING.

Type-setting Machines. See COMPOSING MACHINES.

Typee, tī-pē', a tale by Herman Melville, published in 1846. It was the forerunner of all South Sea romances, and is a narrative of the author's enforced sojourn, in the summer of 1842, among the cannibal Typees on one of the Marquesas Islands. It appeared simultaneously in New York and London, and was extremely popular for a time. Its sequel, 'Omoo' (The Rover), continues the author's adventures, changing the scene to Tahiti.

Typewriter Industry in America, The. The United States census of 1900 gives the number of manufacturing plants in this country producing typewriters and typewriter parts as 47, but in January 1904 these figures come far short of indicating the extent of the American typewriter industry. In Syracuse, N. Y., for example, which since 1900 has become the great typewriter manufacturing centre of the world, there was, in that year a single typewriter factory employing about 700 men. In 1904, in the same city, there were four typewriter factories of the first class, representing as many manufacturing concerns, with an aggregate capacity for the employment of 4,000 operatives. And what is true in Syracuse is true of other American cities where the manufacture of typewriting machines is carried on. Nevertheless, as the 12th census comprises the latest authentic enumeration, we must employ it as the basis of our present reckoning. For the purposes of comparison, which is essential to any record of growth, we have a single period of ten years. Although typewriters were manufactured in America prior to 1880, the industry was not classified separately in census reports until 1890, and, therefore, no statistics before the latter date are available. But the closing decade of the 19th century was marked by no more notable record of growth among its young industries than was that of the manufacture of typewriting machines in response to the public demand,—a demand largely created by an educational campaign on the part of the typewriter manufacturers, but, for all that, genuine and permanent.

Statistics.— In 1893 the total capital invested in the United States in the manufacture of typewriters and typewriter parts was about $5,000,000. In 1890 it was considerably less. In 1900 it was nearly $8,500,000. The typewriter products of the United States in 1890 aggregated in round numbers $3,750,000, and in 1900 $7,000,000. The proportion of products to investment, it will be seen, was slightly lessened, but with the multiplication of plants this was inevitable. The vast increase in the product, however, shows the rapid development of the industry. Seventeen new plants were put in operation during that period and the size of many of the original factories was greatly increased. The number of persons employed in typewriter-making advanced from 1,636 to 4,340, or 166.1 per cent; and wages paid from $945,476 to $2,403,604, or 154.2 per cent. This is the record of the first full decade of successful typewriter manufacture in America. The foregoing figures relative to the number of persons employed apply to actual factory operatives. At a moderate estimate employment is now given to at least 6,000 workmen of this class in the various typewriter factories of the United States. They, however, by no means constitute all to whom the typewriter industry gives direct employment. Nearly every typewriter manufacturing concern of importance has what is termed its "organization," or selling force, working through a system of established branch stores, each with a manager, salesmen, repairmen, bookkeepers, stenographers, clerks and other employees. As branches are maintained in all cities of importance these employees approach the number employed directly in the factories. While typewriter factory operatives, themselves, from the expert character of their work, draw excellent wages, the members of the selling and distributing forces must also be competent to command large salaries. The cost of production as shown by the census reports, covers only the actual expense of manufacture. When the added expense of advertising, branch store rents in all principal cities, salaries of managers, salesmen and all others connected with the organization is joined to the factory cost, the amount of actual outlay per machine is very greatly augmented and the apparent profit of the business correspondingly diminished.

Patents.— The United States Patent Office records show that 2,380 separate United States patents upon typewriters have been granted. This fact alone militates against the entrance into this field of industry of those who lack a thorough experience therein, as without long experience and detailed knowledge of the situation in this respect it is extremely difficult to obtain basic patents of any value. The possibilities of typewriter invention have been so thoroughly exploited that very few of the patents

issued to-day are of much real worth. This, together with ignorance of the considerable cost of marketing, has ruined many worthy typewriter enterprises. To the student of manufacturing conditions the census of 1900 reveals some interesting facts relative to the geographical distribution of typewriter factories throughout the United States. New England, the birthplace and home of so many manufactories of labor-saving devices contained only seven typewriter and typewriter parts factories out of the total of 47 then existing. The Middle States contained 31, or nearly three fourths of all the typewriter factories in America. Twenty-one of these were located in New York State. The Central States have eight and the Southern States only one. In exact detail the distribution was as follows: Massachusetts, 3; Connecticut, 4; New York, 21; New Jersey, 5; Pennsylvania, 4; District of Columbia, 1; Georgia, 1; Ohio, 1; Illinois, 6; Iowa, 1. During the ten years between 1890 and 1900, four typewriter factories — one in Ohio, one in Minnesota, and two in Missouri,— were discontinued, while of new factories established there were 21 — one in Connecticut, eight in New York, three in New Jersey, one in Pennsylvania, one in the District of Columbia, one in Georgia, five in Illinois, and one in Iowa, making a net increase of 17. As will be seen, the greatest increase in the number of establishments was in New York, which has always led in typewriter manufacture, the first practical typewriting machines for the trade having been made in that State. The whole number of typewriters manufactured in the United States in the year 1900 is placed at 144,873, as follows: Massachusetts, 3,839; Connecticut, 19,859; New York, 88,087; New Jersey, 11,175; Pennsylvania, 7,733; Illinois, 12,137; and in all other States, 2,043.

Production.— It would be out of the province of this subject to go into detail as to the names and merits of the different typewriting machines manufactured in the United States or even to quote the relative number of machines turned out in different specific localities, as this would be information which might be used to the advantage of certain manufacturers and the disadvantage of others. Enough has already been said to establish the extent and importance of typewriter making among the great American industries. Carried on in eight States of the Union and the District of Columbia; representing an investment at the present time of not less than ten millions of dollars; giving employment to approximately 10,000 persons and producing an annual output valued at close to $7,000,000, its position among the leading industries of the country does not need demonstration. A feature of interest which remains, however, is the distribution of this immense annual output. Where does it go? Who are the users of the more than 200,000 new typewriting machines which are now produced every 365 days? To answer this we must have reference to tables prepared by the Bureau of Statistics of the Treasury Department at Washington. From the "Summary of Commerce and Finance" for April 1903, we may learn that, of the $6,932,029 worth of typewriter products of the United States during the year 1902, exports were made to nearly all parts of the world to the value of $3,302,191, which leaves but $3,628,838 as the value of that part of the 1902 output of typewriters and typewriter parts which was employed in domestic use. In other words, the foreign shipments of American-built typewriting machines in 1902 practically equaled in value the machines sold in this country.

Exports.— Until the year 1897, American exports of typewriting machines had not gained sufficient importance to entitle them to representation by a heading of their own in the Treasury Department's statistical tables. On the contrary, up to that date they were lumped off with pig-iron, castings, stoves and ranges and various articles under the general head of "Other Manufactures of Iron and Steel." But when the exports of typewriters reached the respectable figure of more than $1,000,000 in a single year, they were dignified with a separate heading. Since that date typewriter exports have advanced by strides, until, in 1902, they were only exceeded in value, in any single line of high grade machinery, by sewing machines and locomotives. The exports for 1903 were much greater, amounting, without question to considerably more than $4,000,000. These figures are not surprising when the great foreign demand for American-made typewriters is taken into consideration. This is almost universal. From the authority referred to above we quote:

> American typewriting machines are exported to all parts of the world, the value of this class of exportations having increased from $1,453,117 in 1897, the first year in which they were separately enumerated, to $3,302,191 in 1902. Shipments were made in 1902 to every European country, those to the United Kingdom amounting to over $1,000,000 in value; those to Germany more than a half million dollars, while to other parts of the world the distribution included British North America, all of the Central American states; Mexico, British, Dutch, French, and Danish West Indies, Cuba, Porto Rico, Haiti, and Santo Domingo; all of the South American countries; China, Japan, Hongkong, Korea, British and Dutch East Indies, Asiatic Russia, Turkey in Asia; in Oceania, to British Australasia, British and French Oceania, the Hawaiian, Philippine and Samoan islands, and to Africa, including British, French, and Portuguese Africa, Liberia, Egypt, and the Canary Islands.

Reports of typewriter exports in 1902 from the United States to the different grand divisions of the world compare as follows:

Europe	$2,517,457
North America	285,501
South America	74,537
Asia	97,181
Oceania	206,066
Africa	121,449

From this table two curious facts will be observed: First, that next to Europe and North America, Oceania is the world's largest user of typewriting machines and, second, that South America, our nearest neighbor among the grand divisions, one of the richest in natural resources, and the logical market place for American-manufactured products, buys of us fewer typewriters than does either Asia or Africa. This condition must soon change, however, as the action of the United States in guaranteeing stable conditions on the Isthmus and undertaking the construction of an isthmian canal, will inevitably result in a tremendous stimulus to South American enterprise and to our trade in that direction. Already South America is awakening to the necessity for the typewriter, as indicated by Peru, where a law was passed in 1903 admitting typewriting machines into that country free of duty, the tariff having previously been 40 per cent *ad valorem*.

Pursuing the subject of foreign distribution

further, we find that among the European countries Great Britain is our best typewriter customer, Germany next and France third. The following table, not only shows the imports of American-made typewriting machines into leading European countries for 1892, but also gives a comparison with the same imports five years earlier when a separate record was first made:

	1902	1897
Great Britain	$1,143,853	$731,152
Germany	697,898	228,710
France	196,657	99,222
Russia	128,794	87,706
Italy	75,575	7,665
Belgium	66,612	39,782
Netherlands	58,453	17,142
Austria-Hungary	46,387	4,088
Spain	33,314	610
Sweden and Norway	29,440	3,889
Switzerland	21,767	10,768
Denmark	21,212	3,564

From the foregoing table the rapid advance in the use of the typewriter abroad may be seen at a glance. In many of the European countries as shown by the statistics the entire growth of their typewriter trade which now amounts to many thousands of dollars annually, has been accomplished in the six-year period covered by the table.

By far the great majority of typewriting machines used in Europe are of American manufacture, for although they have been made to some extent in Germany the German manufacturers have not been able to compete with the American either in price or quality. During the first six months of the year 1900 Germany exported nearly half as many typewriters as she imported from the United States, those exported being German imitations of the American machines. Within three years that was all changed. In a report dated 5 Nov. 1903, Richard Guenther, United States consul general at Frankfort, quotes from a leading newspaper, the *Taegliche Rundschau*, published in Frankfort: "American competition has almost paralyzed some of our industries, for instance, that of typewriters." The European typewriter demand, too, is very intelligent and up to date. From daily consular reports, 13 July 1903, we quote: "Under date of June 15, 1903, Consul C. R. Slocum of Warsaw (Russia) reports that inquiries are being made at his office for typewriting machines of the description known as visible-writing." The typewriter manufacturers of the United States must regard as their best single customer outside of Europe the progressive Republic of Mexico which in 1903 imported American typewriters to the value of $135,556; next comes Australia with $124,024 to her credit, closely followed by British Africa with $120,263. The Philippine Islands' quota was $81,620, British East Indies $36,822, Cuba's $37,393, Japan's $19,935 and the Chinese Empire's $19,333. Argentina is the largest buyer of American typewriters in South America, having imported to the value of $26,162 in 1902. Chile came next with $15,641, and Brazil with $11,858. All that has gone before has made clear the world-wide character of the distribution of this important American industrial product, which, be it remembered, constitutes practically one half of the entire typewriter output of this country.

Home Use.— Now to account for the remainder, to the value of $3,628,838 annually, that are utilized in the United States. Surprise is sometimes expressed in view of the extensive manufacture and sale of typewriting machines in the United States, that there still remains a domestic market for the product. This fact should not excite wonder. In thousands of business houses, whose proprietors 10 years ago would have declared that they had no use for the typewriter, it is now considered indispensable. It has proved itself the only medium by which the vast volume of correspondence, involved in modern methods of doing business, can be despatched. Where once its use was practically confined to court stenographers, lawyers, and the very large business concerns, it has now become the valued adjunct of almost every line of business and trade. Smaller concerns are forced into its use to secure for their correspondence the same attention given to that of larger ones to whom the typewriter has become a necessity for different reasons. Telegraph companies, railroad companies, newspaper offices, etc., have adopted it universally and its use in the home for personal correspondence is rapidly increasing. In every school where the commercial branches are taught it has become a necessity, and thousands of machines are employed in the equipment of these institutions of learning. The life of a typewriting machine has been estimated at seven years, though it is often shorter, owing to lack of care on the part of its operators, and sometimes much exceeds that period. With every possible user in the country once supplied there would still be a considerable demand for machines to replace those worn out in service, and to supply the army of business concerns and professional men that come into the field every year. The domestic demand will never be entirely satisfied and the use of typewriters abroad must necessarily grow for many years to come, as American methods of doing business continue to establish themselves in the out-of-the-way corners and vast undeveloped countries of the world. It must not be assumed, however, that typewriter over-production is impossible. It is true that the demand is great, undoubtedly increasing, and likely to continue stable and permanent until in the course of progress some other wonderful invention shall be evolved which may in the course of another quarter century as completely supersede the typewriter as the typewriter has the pen in the quarter century just past. The world advances. But if typewriter manufacturing concerns were greatly to multiply; if, for instance, the typewriter output of the United States were to be doubled in a single year, there would no doubt be a clogged market and stagnation. At no time since the manufacture of typewriters began has the prospect been less favorable to the inauguration of new typewriter manufacturing concerns which lacked abundant capital and complete knowledge of the business. The present output is much closer to supplying the demand than ever it has been; conditions are liable to arise which will curtail the foreign market, or at least rob the exportation of typewriting machines of a great part of its present profit. Already the European countries recognize and are taking steps to avert what they call "the American menace." The recent protective tariff agitation in Great Britain, the pronounced attitude of Germany, and the growth of similar sentiment else-

where are indications that the Old World is waking up and putting on its armor for a struggle against American trade supremacy. What the outcome of this may be none can tell, but it is a condition that must be reckoned with by American manufacturers. Basic typewriter patents, as has been stated already, have become very difficult to secure without interference, and manufacture without such patents is always attended by danger of litigation and possible failure.

Bibliography.— 'Summary of Commerce and Finance,' (United States Treasury Department April 1903); 'United States Consular Reports,' (1900 to 1903 inclusive); 'Census Bulletin No. 239' (United States Treasury Dept. 28 July 1903) and literature issued by various leading typewriter companies.

L. C. Smith,

L. C. Smith & Bros. Typewriter Co., Syracuse, N. Y.

Ty'pha, the cat-tails or bulrushes, the typical genus of perennials growing in swamps, the somewhat sword-shaped bases of the leaves often submerged. The leaves of *T. latifolia* are radical, long and linear; the flowers are monœcious in a cylindrical spike, terminating a tall stem, and subtended by fugacious bracts. The perianth consists of bristles, with stamens or ovary according to sex; the staminate flowers are at the apex of the stem and after pollinating gradually disappear, leaving the lower fertile ones to mature their fruits. When ripe, these fruits form decorative cylindrical masses, of a handsome seal-brown color, at the level of, or a little higher than, the tops of the leaves. During the winter these spikes disintegrate and the nutlike fruits float away, supported by the white hairs expanding at their bases. The smaller species (*T. augustifolia*) has spikes in which the staminate and pistillate portions are slightly separated. Both are widely distributed. As is the case also with the western American species, the abundant mealy pollen of *T. elephantina,* or elephant-grass, serves for bread in India and New Zealand, and also as a substitute for matches and tinder, since it is very inflammable. The plant is a favorite food of elephants. *Typha* rhizomes abound in starch, and when rid of their acridity become a food of various peoples; they have also been employed as an astringent and diuretic drug, and the down of the fruits serves as a dressing for wounds and for upholstering purposes. See Bulrush; Tule.

Typhoid Bacillus. This bacillus, the cause of typhoid fever, was first discovered by Eberth in 1880. He found it in the glands of the mesentery and in the spleen. It was not until 1884, however, that Gaffky obtained the organism in pure culture. He first used a potato culture-medium, and was fortunate in obtaining the organism, for since its discovery it is becoming more and more evident that the typhoid bacillus is very closely allied to a great variety of other forms, and it is now necessary to use a very complicated technique in order to separate this form from a number of allies. One form, the *Bacillus coli commune,* or colon bacillus, a constant inhabitant of the intestinal canal, resembles the typhoid bacillus so closely that as late as 1890 no less an authority than Koch declared that a sure means of differentiation between the typhoid and colon bacillus had not been discovered. Since then, however, work by a number of bacteriologists, Pfeiffer, Wassermann, Löffler, Abel, Hiss, and others, has given a series of distinguishing signs, so that at the present time it is possible to make a definite separation of the typhoid organism from all others. The typhoid bacillus is a short, comparatively plump rod, varying in length from $\frac{1}{25000}$ to $\frac{1}{8000}$ of an inch and in width from $\frac{1}{50000}$ to $\frac{1}{30000}$ of an inch. It has a number of flagella (10 to 12) which enable it to move. The marked motility of the typhoid bacillus is of much importance in the study of this form, since the so-called blood-test, or Widal's test for typhoid, depends on a change in this characteristic. For the details of its cultural characters standard works on bacteriology should be consulted, but it is of importance from the standpoint of sanitary science and preventive medicine (q.v.) to realize that the typhoid bacillus is capable of growing, for a time at least, in many different foods and drinks, particularly in milk and in water. Every patient with typhoid fever is constantly giving off millions of these small bacteria in stools and in urine. From these two main sources the great danger in typhoid contagion comes, for soiled fingers of chambermaids, flies, household implements may all prove intermediaries in conveying the bacilli to food and thence into the digestive canal of a well person. Or the fæces and urine may soak into a well or other source of drinking water supply, and thus be the means of causing extensive epidemics. Contagion by uncleanliness and lack of care in disinfecting the stools and urine is responsible for most cases of typhoid fever. Destroy the bacillus, by heat or by proper chemical means, and typhoid fever will disappear. See Bacteria; Typhoid Fever; Widal's Test. Consult: Muir and Ritchie, 'Manual of Bacteriology'; Kolle and Wassermann, 'Handbuch der pathogenen Mikroorganismen' (1902–4).

Typhoid Fever, or **Enteric Fever,** a specific continued fever of long duration, and communicable, due to the *Bacillus typhosus.* It is usually attended with diarrhœa, sometimes with an eruption, and is characterized by inflammation and ulceration of Peyer's patches (q.v.) in the small intestine, by enlargement of the spleen and mesenteric glands, and catarrhal inflammation of the intestinal mucous membrane. It is one of the exanthemata (q.v.). This fever was called typhoid, and at one time abdominal typhus, from its supposed resemblance to typhus fever (q.v.). It has also been known as low and as slow fever, and as autumnal or fall fever. It is considered to be a preventable disease, yet it prevails frequently as an endemic and epidemic, especially in large cities, destroying many lives. It occurs most often in the fall and early winter, and mostly between the ages of 18 and 45, when men especially are less prudent, and run more to excesses than at other periods of life. Improper dwellings and bad sanitary environments, excess in eating and drinking, want of sleep, and too much mental work — by these the vitality is undermined, predisposes persons even in the prime of life, to the onset of typhoid, especially if it be prevailing in their community. It is believed that the blood of such persons has undergone some chemical change which has diminished its

bactericidal quality and so lowered its inherent power of resistance to disease. It is not very uncommon to find vigorous young men at work with temperatures of 102° to 104° F., who give no sign of surrender until they are obliged to succumb from severe pain or other pronounced symptom.

Typhoid fever is frequently, if not always, a septicæmic disease, and its range of infectivity is greater than is usually supposed. The bacillus has been found in the blood, urine, fæces, and sputum. Milk, vegetables, flies, oysters, etc., are bearers of the germs. Some believe that the bacilli are conveyed by air to the respiratory mucous membrane, and that their initial colonization takes place there, rather than in the gastro-intestinal tract. But drinking water polluted by the bacilli through infected sewage, etc., is the most frequent cause of typhoid infection. Germs from a single case of typhoid may find their way into springs and other sources of water supply and cause widespread dissemination of the disease. The epidemics in Lausanne, Switzerland (1872), Chicago and Philadelphia (1890–1900), and Ithaca, N. Y. (1903), are examples of typhoid outbreaks caused by polluted water. "In Vienna, when for a period the water supply from guarded springs was turned into the city, typhoid, which had persisted in epidemic form for years, almost entirely disappeared; and when, as the drier season advanced, this purer supply was insufficient and the water of the Danube was again turned on, the scourge broke out with renewed violence, but in those parts of the city supplied by river-water. This experience was repeated in Paris, and it is practically true of every city supplied with drinking water from exposed streams and lakes." Freezing does not sterilize water, so that contaminated ice used in drinking fluids, or coming in direct contact with food, is a source of infection. The boiling of water is a safeguard, while filtration is not trustworthy in the elimination of infective organisms. Infection may occur from milk through the polluted hands of milkers, or from the washing of receptacles for milk in cold water polluted by typhoid discharges. Such vessels should be thoroughly scalded. The ingestion of uncooked articles of food, and especially of salad vegetables — lettuce, celery, etc.— raised in ground fertilized by infected sewage, is a source of infection, as is the ingestion of oysters and clams grown in water similarly contaminated. Dust carrying typhoid germs, if inhaled, may convey the disease into the system. That flies which have found access to the excrement of typhoid fever patients may carry the infecting organism to food, and so produce typhoid, was proved in the Spanish-American and the Boer wars. The danger of typhoid in armies is always imminent; soldiers will drink polluted water, not caring to wait till it is boiled; the ground becomes saturated with discharges; flies and dust abound; and many of the men will not keep clean. "Typhoid fever in our camps," says Sternberg, "has been to a large extent due to the neglect of well-known sanitary measures." This has been the experience in nearly all wars.

Experiments have shown that infected clothing, surface soil, fæces, and urine retain active bacilli for many days, and there is reason to believe that typhoid is sometimes spread through infected hands, clinical thermometers, water-closets, clothing, etc. The New York Department of Health, which insists upon the importance of disinfecting the urine as well as the fæces of typhoid patients, states that "it is probable that in 50 per cent of the cases the typhoid bacilli are present in the urine at some stage of the disease," and recommends keeping the urinal or bed-pan partly filled with a 1 to 20 solution of carbolic acid.

Two important means in the diagnosis of typhoid have come into use within the last few years; namely, Erlich's test, or the diazo-reaction, and the Widal test. The first, which has the advantage of being more readily applied, is as follows: "Equal parts of the suspected urine and a solution (saturated solution of sulphanilic acid in 5 per cent hydrochloric acid 40 parts; 0.5 per cent solution of sodium nitrite 1 part) are mixed and well shaken. On the addition of a few drops of ammonia a brilliant rose-pink color should appear, if the case be one of typhoid fever. The 12-hour sediment is also characteristic, consisting of a dirty gray lower layer and a narrower dark olive-green upper layer."

Prophylaxis.—"An epidemic is like a conflagration,— it is more easily suppressed at the beginning." "An ounce of prevention is worth a pound of cure." These are two sayings quite applicable to typhoid fever. The Ithaca epidemic might have been prevented by keeping the water supply pure; but once started, "all the science of the 20th century could not save all the lives." Purity of water and cleanliness of foods, proper cooking, the thorough removal and destruction of refuse, the use of septic tanks for sewage, and other hygienic measures are the means for preventing the origin and spread of typhoid; but these measures must be persistent, not spasmodic. The term summer typhoid is frequently applied to typhoid fever appearing in cities in the fall, but originating in country summer resorts — classed, it may be, as healthful.

Within the last few years, a so-called curative serum proposed by Macfayden has been used hypodermically, as a cure and preventive with some good results. This inoculation has also in some instances apparently warded off relapses, which are among the features of typhoid fever.

In 1901 Parkes and Rideal reported that after detailed experiments made to determine what substances could be added to drinking-water containing typhoid or other infecting micro-organisms to make it innocuous, they had decided upon acid sodium phosphate or sodium bisulphate, in compressed tablets of five grains each, to be used three to a pint of water 15 minutes before drinking, and when not in use to be kept in a closed receptable, as a metallic box. They believe that the substance will be efficacious unless the water is very badly polluted. The statement has been made repeatedly in newspapers that lemon-juice destroys the typhoid bacillus, and therefore should be added to suspected drinking-water. W. H. Park, the bacteriologist, shows on the contrary that while the acid kills the micro-organisms it requires too much acid and too much time for the chemical action to take place to render lemon-juice a practical agent for their destruction.

Symptoms and Course of the Disease.— The duration is usually from three to four weeks

in adults in cases of recovery, though the patient may be sick many days beyond the 28th, owing to diarrhœa, loss of muscular tone, flabby heart, etc. Death may occur in the first and even the fourth week, or later, but usually takes place in the second or third week. It may result from a peritonitis set up by perforation of an ulcerated spot, from intestinal hemorrhage, even after all the leading symptoms are gone, from diarrhœa, pneumonia, nephritis, embolism, thrombosis, etc. The period of incubation, which is not definitely known, is variously stated to be from 7 to 21 days. It is difficult to determine the exact time of exposure to the poison, and the onset of the attack is usually insidious.

First Week.— The disease begins with more or less fever, lassitude, and aching "in the bones," and sometimes a chill, more often a chilly feeling, especially when the hands are put into cold water, or the person is exposed to cold air. Headache, pains in the back and limbs, alternations of chilliness and heat, and somesometimes vomiting, nosebleed, diarrhœa, and tenderness of the abdomen supervene. The pulse rarely exceeds 85 or 90; the tongue is moist, but covered with a thin coating; the fever gradually increases, remission occurring in the morning. Toward the end of the first week the tongue becomes dry, delirium is likely to occur, weakness is marked, consciousness is numbed, and diarrhœa may increase. Toward the end of this week a rash sometimes appears, consisting of small pink spots, most abundant on the abdomen and chest, then on the back, and rarely on the face and extremities. The spots continue to come out as long as the fever continues, do not coalesce, disappear under pressure, and do not become hemorrhagic.

Second Week.— The tongue is very dry; if there has been diarrhœa it increases, or may appear for the first time, and is attended by gurgling, the discharges having a peculiar "pea-soup" appearance. There is more or less tenderness over the ileo-cæcal region, due to the inflammation of Peyer's patches, and some tumidity of the abdomen. Delirium increases; temperature rises at night to 102°, 104°, 105° F., or more with sharp declines in the morning (steeple-like rises, as shown on temperature chart); the pulse is frequent — 100 to 120.

Third Week.— Gradually the patient passes into the third week, and symptoms slowly abate; or he grows worse; then the tongue cracks and bleeds; sordes appear on the lips, teeth, and tongue; he has low muttering delirium; tympanitis is considerable; fever continues. He may recover even now, but there is the possible danger of hemorrhage, perforation, or a serious depression of the vital forces, at any stage of the disease, but chiefly in the second and third weeks. As recovery sets in the greatest care is necessary that the patient shall not overeat nor exert himself unduly, lest a relapse should occur, or a serious complication be induced.

Treatment.— The treatment consists of rest in bed from the outset, diet, hydrotherapy, and medicines. The food through most of the sickness should be largely liquid — milk, peptonoids, etc., and predigested material, but always adapted to the patient's powers of digestion. If curds or undigested food be seen in the stools, all food should be suspended for a considerable time, or given of another kind and in small quantity every three or four hours. Later, bread and milk, milk pudding, with rice or tapioca, eggs lightly boiled, poached, or shirred, and cocoa may be given. The patient may drink freely of water at any time, and may have fruit-juices. When the temperature has been normal for several days he may have fish, chicken, broths, soups, and may carefully and gradually resume ordinary food. Sponging with tepid or cold water, vinegar and water, or alcohol and water, and the use of wet packs — as frequently as they can be used with apparently good results are often more serviceable than drugs. Yet medicinal measures are often necessary. Coal-tar derivatives should never be used except to lower the temperature, and then very carefully. Eliminatives, as calomel, and intestinal antiseptics, as salol, are useful. Acetozone, or benzoyl-acetyl-peroxide, is now used internally as a germicide with benefit in many cases. Stimulants should only be used when there are signs of heart-failure, and then in moderate quantity — brandy, whiskey, champagne, ether, and camphor. Opium, carefully used in excessive diarrhœa or in peritonitis; ice internally, and applied to the abdomen in intestinal hemorrhage; ergotine hypodermically; bromide of sodium, etc., producing necessary quiet or sleep, are all of value; but the disease cannot be shortened in its course to any extent, though its severity may be modified. Skilful nursing therefore is necessary. The prevention of bed-sores and the keeping the mouth clean add much to the patient's comfort and help him to recover.

Typhoid fever in children is more common than was at one time believed. It is the "remittent" fever of childhood, the "infantile hectic" fever, etc., and seldom occurs under one year of age. It does not conform closely to the type of typhoid in adults, and differs as to distinct stages and well-defined temperature changes. It runs its course in from 10 to 20 days, and is characterized by gastro-intestinal catarrh, fever, prostration, wasting, nervous symptoms, and scanty isolated eruption.

JEROME WALKER, M.D.,
Author of 'Walker's Physiology.'

Typhon, tī'fŏn, in Greek mythology, a giant, the son of Tartarus and Ge. He had 100 heads shaped like those of a serpent, and with devouring flames darting from the many mouths and eyes. Typhon, as soon as born, made war on heaven to avenge the death of his brother giants, compelling the gods to fly for safety; Jupiter, however, regaining courage, threw off the resemblance of a ram which he had assumed, and, hurling his thunderbolts at the audacious invader, flung him to earth wounded and writhing, when, to prevent his recovery, he cast Mount Etna at his head, and buried the rest of his body beneath the earth. Through this vast mountain, however, the imprisoned giant still belches forth his fire and smoke, and howls his discordant thunder. Consult Longfellow's poem 'Enceladus.'

Typhoon. See CYCLONE.

Typhus Fever, a highly contagious eruptive fever, one of the exanthemata (q.v.), formerly known as putrid, ship, jail, or camp fever, and by other names. The disease is very rare in this country, and when it appears it is usually in the line of immigrant travel. But owing to

the very strict quarantine regulations of the American and Canadian governments it is seldom imported, or if introduced is stamped out by thorough isolation and disinfection. A constant vigilance is exerted to prevent the importation of old rags, which are seldom free from infection. The disease is also rare in the great centres of population in Europe and elsewhere, but it is epidemic in certain towns in Ireland, Russia, Egypt, India, and Mexico. It is a filth-disease, therefore a disgraceful disease, and its occurrence is favored by overcrowding, bad ventilation, poor food, etc., and is especially more likely in winter. Though resembling typhoid fever in some respects, it is easily recognized, quarantined, disinfected, and controlled. It is not positively known at the present time whether there is an infecting organism. The contagion is conveyed by inhalation of the breath, of exhalations from the skin, of infected dust from a room, or of the infection from fomites. There are no characteristic lesions, except that the blood contains but little fibrin, and is darker than normal, and the spleen and liver are engorged and softened. Sometimes the stomach and lungs are also softened. The real cause of death is not usually ascertained. The mortality of typhus fever is not much more than that of typhoid fever when there is good ventilation and strict attention to other hygienic measures, but in over-crowded and badly ventilated prisons, etc., it is very great. The average duration of typhus (14 to 21 days) is less than that of typhoid fever. The incubation period varies from one to two weeks. The fever begins much in the same way as typhoid, with lassitude, aching in the limbs, headache, chills or chilliness, rapidly rising temperature, and dark flushing of the skin. The eyes are moderately congested; there is little disposition to diarrhœa; the abdomen is not swollen or tender; and the patient is not likely to vomit or to have nosebleed. The tongue soon becomes dry and dark, and sordes form; the pulse is frequent; as the fever reaches its height the breath and perspiration have a peculiar musty order, and the patient passes from a state of delirium into a nearly comatose condition. Toward the end of the first week (usually the fourth or fifth day) an eruption appears on the sides of the abdomen, in the axillæ, and about the wrists. For the next two days it continues to appear over the rest of the skin, except that of the face, and is most abundant on the trunk. After the third day it ceases to come out. At first the spots disappear under pressure, but after a day or two they fade out like black-and-blue spots, and in another day or two a small petechial hemorrhage appears in many of them. At its height the rash has a dull red color which Sir William Jenner compared to the juice of a ripe mulberry. When the spots coalesce and spread over a large space much danger is indicated. Treatment consists in combating the evils which give rise to the disease. The patient should be kept in a well-ventilated room with windows open even in winter; but he must also have plenty of bedclothes and there must be a fire in the room. Keep the room and patient thoroughly clean, and see that he has an abundance of good and easily digested food. Stimulants and other medicines will be seldom needed, yet a physician must not be dispensed with, since complications such as erysipelas and abscesses may occur.

Typograph'ical Union of North America, a society of typesetters banded together for mutual protection, for the regulation of wages, fixing the number of apprentices allowed to each establishment, the length of time each apprentice must serve in order to become a master workman, and for extending general aid to the members of such association. The international or supreme body is composed of delegates from subordinate unions in the United States and Canada. The management of the internal affairs of each union is left almost entirely to the subordinate divisions. Thus each local union may regulate the number of apprentices, the scale of wages for composition, time work, etc. Whenever a member of one local union comes within the jurisdiction of another local body, he at once is subject to the by-laws of the latter. Traveling cards are granted to members, but these cards must be deposited with the local union within the jurisdiction of which its holder proposes to remain for a given length of time, and dues must be paid into the local union with which the card is deposited. There are hundreds of local unions in the United States, that of New York being the largest, having a membership of several thousand — followed by Chicago, Philadelphia, Boston, Saint Louis, and other large cities of the country. The International Union meets once every year, at different places in the United States or Canada.

Typog'raphy. See PRINTING.

Typothe'tæ, a name given to a trade guild consisting of persons connected with the printing trades, both workmen and employers. In the year 1465 the Emperor Frederick III. of Germany "permitted printers to wear gold and silver, and both the typographi and typothetæ were honored by him with the privilege of bearing coat-of-arms, and wearing armor. The shield of the typothetæ bore an eagle with extended claws, and the open helmet was surmounted by a crown." The first use of the name in the United States was in 1863, when P. C. Baker of New York proposed the name for a society of employing printers in that city. The name was adopted, but the society did not survive long. In 1883 the New York society was resuscitated, and the name readopted. From that city similar organizations spread all over the country. The Typothetæ has local and international organizations, and is benevolent and fraternal in some of its aspects.

Tyr, tĭr, in Norse mythology, the son of Odin, and the god of war and of renown. According to the Edda, he had but one hand. When the Asa-gods persuaded the wolf Fenrir to allow himself to be bound with the Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened; and when the gods refused to release him, the wolf bit off Tyr's hand to the wrist, which was called in consequence, Ulflithr, or the Wolf's Joint. In the twilight battle of the gods, he meets his death at the same time with his enemy, the monster dog Garmr.

Tyrant, a word derived from the Greek *turannos,* which signified an absolute ruler. The word did not have originally the bad signification which we now attach to it; but as it is a

rule which admits of very few exceptions, that the possessor of uncontrolled power, whether individual, corporation, or multitude, will abuse it, tyrant came at length to signify an abuser of power, particularly of the chief power in the state.

Tyrconnel, tĕr-kŏn'ĕl, **Richard Talbot**, Earl of, viceroy of Ireland: b. about 1625; d. Limerick 14 Aug. 1691. He was the youngest son of Sir William Talbot, a prominent figure in politics under James I. At Drogheda he was with the forces that withstood Cromwell. On the accession of James II. Talbot was at once made Earl of Tyrconnel and placed in command of the troops in Ireland, where he strove to secure the king's independence of Parliament by favoring Roman Catholics in the army and in official preferments, at the expense of Protestants, many of whom he summarily dismissed. In 1687 he was made lord deputy of Ireland, an appointment that added dismay to the consternation which he had already spread among the English Protestants there, many of whom quitted the country, a great part of which was given over to lawlessness, commercial decay, and general wretchedness. In 1689, when James reached Ireland after his flight from England, he created the earl Duke of Tyrconnel. After the battle of the Boyne (1690), in which he fought, the duke retired to France, but in 1691 returned to Ireland and further endeavored to serve the cause of James, which, however, was soon hopelessly lost.

Tyre, tīr, Palestine, one of the most celebrated cities of antiquity, and, with its elder sister, Sidon, the richest and most important commercial city of Phœnicia, on the Mediterranean, 50 miles south of Beirut. Ancient Tyre was built partly on an island and partly on the mainland, the island being nearly three fourths of a mile from the mainland. Alexander the Great, when he besieged Tyre (332 B.C.) constructed a causeway from the mainland to the island, and the modern Tyre or Sûr, which occupies part of the former island, is still reached by a broad embankment. It is a place of 6,000 inhabitants, including many Roman Catholics, besides Greeks and Protestants, with schools for the different bodies, a monastery and convent, etc. The part of the city situated on the mainland was called Old Tyre, and is assumed to have been the original city. The city appears to have existed only on the mainland when besieged by Nebuchadnezzar, but the insular fortifications formed its chief strength when besieged by Alexander the Great. As early as 1200 B.C. Tyre was a powerful city, enriched by commerce and refined by the arts. The ancient Gades (Cadiz) and Carthage were Tyrian colonies. The most celebrated siege of Tyre was that by Alexander the Great already referred to. It was again taken by Antigonus, after a siege of 15 months, in 313 B.C. Three ecclesiastical councils were held at Tyre — the first in 335, when Athanasius was stripped of his bishopric and banished from Alexandria; the second in 448; the third in 519. Relics of the splendor of the ancient city are everywhere to be seen in numerous and beautiful columns, ruins of an aqueduct, and other buildings.

Tyr'ian Purple. See Purple.

Tyrnau, tĭr'now, or **Tirnau**, a town of Hungary, about 30 miles northeast of Presburg, on the Waaj Valley railroad. Its interest was lost when the university was removed to Pesth (1635–1754). It was formerly the residence of the Hungarian primates. Pop. 10,000.

Tyrol, tĭr'ŏl (Ger. tē-rōl'), or **Tirol**, Austria, a crownland and principality, situated in the western part of the empire, and bounded on the north by Bavaria, on the east by the crownlands of Salzburg and Carinthia, on the south by Italy, and on the west by Italy, Switzerland, and Vorarlberg. With the latter crownland it forms an administrative district. Its area, exclusive of Vorarlberg, is 10,300 square miles. Almost the whole area is included in the Eastern Alps, which are here almost as high and quite as complex, wild, and romantic as the Swiss Alps, including large glaciers, gorges, and mountain torrents. The highest point is the Ortler Spitze on the western boundary; altitude, 12,802 feet. The chief rivers are the Inn in the north, flowing into the Danube, and the Adige in the south, flowing to the Adriatic. But little of the soil is suitable for agriculture though considerable quantities of grapes and fruits are grown. Cattle, sheep, and goats are raised in large numbers. Iron, zinc, copper, and lignite are mined to some extent. The principal industries are cotton spinning and weaving. The chief exports are cattle, cheese, lard, wine, and fruit. Of the inhabitants 55 per cent are German and 44 per cent Italians; nearly all are Roman Catholics. The capital is Innsbruck. Tyrol was anciently a part of Rhætia. It came under the dukes of Austria in 1363. In 1805 it was ceded to Bavaria, but restored to Austria in 1814. Pop. (1900), exclusive of Vorarlberg (q.v.), 852,712.

Tyrone, tĭ-rōn', **Hugh O'Neil**, 2d Earl of, Irish chieftain: b. about 1550; d. Rome 1616. He was the grandson of the 1st earl, and son of Baron of Dungannon. His early life was spent in England. After the murder of his brother in 1562, he returned to Ireland, succeeding to the barony. He was called "The O'Neil," and was the leader of the Irish insurrection against Elizabeth and English occupation. Both Connaught and Leinster soon joined the standard of the Ulstermen, and were met by an English army under the Earl of Essex and engaged in a war for supremacy. For some years Tyrone baffled the English army, but was overcome by Lord Mountjoy in 1603, in spite of the aid of Spain, and compelled to surrender. He was pardoned later and reinstated in his earldom. In 1607, being suspected of further intrigue, he fled to Brussels, and later to Rome, where he passed the remainder of his life and died in penury. Consult: Meehan, 'Fate and Fortunes of Tyrone and Tyrconnel'; Gainsforde, 'True Exemplary and Remarkable History of Hugh, Earl of Tyrone' (1619); Bagwell, 'Ireland Under the Tudors.'

Tyrone, Pa., borough, Blair County; on a tributary of the Juniata River, and on branches of the Pennsylvania railroad; about 15 miles north by west of Altoona and 90 miles west by north of Pittsburg. It was settled in 1840 and incorporated as a borough in 1857. It is in an agricultural region in which there are deposits of iron, and nearby considerable timber. The chief manufacturing establishments are railroad shops, paper mill, iron works, lime kiln, lumber mills, shoe factory, and candy works. The number of employees (1904) was about 1,500. The

number of manufactories (government census 1900) was 69. The amount of capital invested was $1,098,861; the number of employees, 560; wages paid annually to manufactory employees, $243,711; value of products annually, $1,305,899. The educational institutions are a high school established in 1878, public and parish schools, and a school library. There are nine churches. The three banks have a combined capital of $250,000, and the annual business amounts to $2,000,000. The government is vested in a burgess and a council of 14 members who hold office for two years. Pop. (1890) 4,705; (1900) 5,847.

C. W. Jones,
Editor 'Herald.'

Tyrotox'icon, or Cheese Poison, a ptomaine or poisonous principle produced in cheese and in milk by putrefaction, and the usual cause of the poisonous symptoms sometimes following the eating of ice-cream and other milk or cream preparations. The name was first bestowed by Kuhn of Leipsic in 1824 on the poisonous principle in putrefied cheese, and by Vaughan of Michigan in 1885 on the alkaloid that he obtained by evaporating an acidulated aqueous and etherized extract of the poisoned cheese. Tyrotoxicon poisoning is accompanied by intense pain, nausea, diarrhœa, throat constriction, and weakening of the heart's action. Prompt treatment should be rendered in the form of emetics, or saline purgatives, and tonics to stimulate the heart's action. See Ptomaines.

Tyrrell, tĭr'ĕl, **Robert Yelverton,** Irish classical scholar: b. Ballingarry, Tipperary, 21 Jan. 1844. He was graduated at Trinity College, Dublin, and appointed regius professor of Greek at Dublin in 1880. He is the author of: 'Bacchæ of Euripides' (1891); 'Correspondence of Cicero' (1879–1900); 'Acharnians of Aristophanes in English Verse' (1883); an 'Anthology of Latin Poetry' (1893) and other notable works.

Tyrrhenian (tĭ-rē'nĭ-an) **Sea,** that portion of the Mediterranean Sea which is enclosed between Sardinia, Sicily, and the Italian peninsula.

Tyrtæus, tẽr-tē'ŭs, Greek poet who flourished about 680 B.C. His birthplace is unknown. In the war between the Lacedæmonians and Messenians, the former applied to the Athenians for a general; and the latter, it is said, in derision, sent them Tyrtæus. The bard, however, so inspired the Spartans by his warlike songs, that they reduced the Messenians to subjection. He was accordingly treated with great respect, and received the rights of citizenship. Some fragments of his songs are extant. His poems are in Greek elegiac metre and in the time of the Hanoverian monarchy were translated into English and disseminated throughout the army for the purpose of fostering the warlike ardor of the soldiers.

Tytler, tĭt'lẽr, Patrick Fraser, Scottish historical writer: b. Edinburgh 30 Aug. 1791; d. Malvern, England, 24 Dec. 1849. He was educated at the University of Edinburgh, and in 1813 was admitted to the bar of Scotland. In 1837 he removed to London, where he devoted himself exclusively to historical writing and other literary pursuits. His 'History of Scotland,' begun in 1828, was completed in 1843, and was accepted as a standard work. He was also the author of a life of Wyclif, and of biographies of Sir Walter Raleigh and the Admirable Crichton.

Tytler, Sarah. See Keddie, Henrietta.

Tzana, tsä'nä, **Lake.** See Dembea.

Tzetze, tsĕt'sĕ, a musical instrument of the guitar kind, formed of a long carved neck attached to a gourd. It has one string usually made of the tough fibre of a palm tree. The tzetze is of Abyssinian origin.

Tzetzes, tsĕt'sēz, **Johannes,** a Byzantine author of the 12th century. His 'Chiliades,' a very dull collection of 30,000 "political iambics," whose theme is stories drawn from Greek history and mythology, has been edited by Kiessling (1826); his 'Iliaca,' a résumé of Homer's 'Iliad' and kindred poems, by Bekker (1816). Commentaries on Homer, Hesiod, the 'Plutus' of Aristophanes, and Lycophron's 'Alexandra' (ed. by Müller 1811), make up the remaining works of Tzetzes.

U

U the twenty-first letter and fifth vowel of the English alphabet. Its form in the Latin alphabet was V. In the Greek alphabet the character Υ represented a vowel sound different from that represented by the Latin V (the vowel *v* or *u*); probably this Greek letter stood for a sound like that of *u* in French, which in German is represented by *ü;* and the Greeks had no character in their alphabet to represent the pure and simple vowel sound which *u* had in Latin and has in modern European languages except English and French: this vowel sound the Greeks represented by the digraph ου as it is usually represented in English by the diagraph *oo;* and in French by *ou.* When a Greek word containing *v* was to be translated into Latin the *v* was represented by *y,* and the same is still done in English: Thoukydides (Θουκυδίδης) and τύχη became Thucydides and Tyche. In the Latin alphabet the vowel *u* (*oo*) and the consonant *u* (or *w,* or *v*) were both represented by *V,* and not till late in the 16th century was the form *V* restricted to the consonant element. The sound of *u* (*oo,* not as named in English, *yu*) is produced by rounding the lips to the fullest extent consistent with a clear vowel sound and raising the back of the tongue higher than for any other rounded sound. This sound, short, is heard in *full,* and long in *fool;* and it is commonly represented in English by that digraph *oo;* in French it is represented by *ou,* but in the rest of the European alphabets by *u.* The fact that the primitive vowel sound *u* is expressed in English by *oo* is an indication that at one time the *o*-sound has a tendency to pass into the sound of *u:* thus *good, foode,* once were *gode, fode.* Besides the sound heard in *too* and *full, u* represents in English two other sounds, namely the vowel sound heard in *tub, but,* and the diphthongal sound heard in *use, repute.* The sound of *u* in *but, tub* is peculiar to English, and in unaccented syllables is represented also by other vowels, as *a, e,* and *o*; examples *every, common, fashion,* which might be written *evury, commun, fashun.* According to Alexander J. Ellis, the letter *u* in Chaucer's time was pronounced like French *u* in words derived from the French; and Sir John Cheke, writing 200 years after Chaucer, declares that in his day the *u* in *duke, lute, rebuke* was sounded "like the Greek upsilon," that is, like the French *u.*

Uaupés, wä-ō-pās', Colombia, a river rising in the eastern cordillera of the Colombian Andes, and flowing southeastward to the Rio Negro, which it joins in the northwestern corner of Brazil. Length about 700 miles.

Ubangi, oo-bäng'gē, or **Mobangi,** mō-bäng'gē, a river of Equatorial Africa, a tributary on the right bank of the Kongo, which it enters in lat. 0° 30′ S. It is the lower course of the Welle or Makua, which has its sources to the north of Lake Albert Nyanza. It is navigable, but there are difficult rapids at Zongo in 40° 20′ N. Throughout a large part of its course down to its confluence with the Kongo it forms the boundary between the Kongo Free State and French Kongo. By means of the Kongo and the Ubangi it is possible to go from the coast of the Free State almost to the Nile Valley. The basin of the river is very fertile, and more thickly populated than most other parts of Central Africa.

Uberti, oo-bĕr'tē, **Bonifazio, degli,** Italian poet: b. Pisa about 1309; d. after 1368. He belonged to the noble family of Uberti, his grandfather having been a leader of the Florentine Ghibellines, and spent much of his time in exile. His 'Dittamondo,' an unfinished didactic poem in the style of the 'Divine Comedy' of Dante, placed him among the celebrated writers of the Italian Renaissance. His lyrical poems received much later recognition.

Ubiquarian, ū-bĭ-kwā'rĭ-an, or **Ubiquitarian,** a believer in the doctrine that the body of Christ, in virtue of the hypostatic union of his divine and human natures, is everywhere — in Latin, *ubique.* This opinion was held by individual theologians in the 10th and succeeding centuries, foremost among them the renowned English schoolman William of Ockham in the 14th: Christ's body after his resurrection, he held, is ubiquitous. In the conference at Marburg of Luther and Melanchthon with Zwingli and Œcolampadius, Luther explained in this way the true, real, corporeal presence of Christ in the Eucharist; and in the authoritative Formula of Concord (1577) the doctrine of the ubiquity of Christ's humanity is expressly taught. But after Luther's death Melanchthon and other leaders repudiated Luther's doctrine of consubstantiation, while Brentius and Andreæ defended it as an article of Lutheran orthodoxy.

Ucayale, oo-kī-ä'lä, or **Ucayali,** Peru, a river flowing northward through the eastern part of the country, and joining in lon. 73° 20′ W. the Amazon, of which it has sometimes been regarded as the true upper course. Its main headstream, the Apurimac, rises in the mountains 115 miles northwest of Lake Titicaca, and another headstream, the Mataro, comes within 100 miles of the Pacific coast opposite Lima The headstreams water the most populous districts of Peru, but the main course lies in the

wild, forest-covered lowlands. It has a length of about 1,500 miles, more than half of which is navigable for steamers.

Uccello, oot-chĕl'lō (Paolo di Dono), Italian painter: b. Florence 1397; d. there 1479. He began as a goldsmith and worker in metal, assisting Lorenzo Ghiberti (q.v.) in the first pair of gates made by the latter for the Baptistery at Florence. His name of Uccello ("Bird") was given to him from the number of birds he kept as models for his pictures. Among the few works of his which have survived is a heroic sized equestrian figure of Sir John Hawkwood in the cathedral at Florence, painted in terra verde (q.v.). In the Louvre there is a picture of his which is principally interesting from the fact that it contains life-sized portraits of Giotto, Donatello, Brunelleschi, Manetti, and Uccello himself.

Uchean, ū'chē-an (adapted from *Uchee* or *Yuchee*), a linguistic stock of North American Indians who, in the 16th century, lived on both sides of the Savannah River as far as its mouth, in South Carolina and Georgia. They are supposed to be identical with the "Cotifachiqui" of De Soto's chroniclers, whose principal settlement was at the site of Silver Bluff on the Savannah, in Barnwell County, South Carolina. In 1729 a portion of the Yuchees left their old seats and settled among the Lower Creeks on Chattahooche River, where they established three villages in the neighborhood; and later on a Yuchee settlement is mentioned as existing on the Lower Tallapoosa, among the Upper Creeks. The tribe finally became practically a part of the Creek confederacy, and on the removal of the latter to the Indian Territory the Yuchees went with them. There are now about 600 of the tribe, usually classed as Creeks, but while the latter are doubtless intermarried with them, the Yuchees are jealous of their name and tenacious of their position as a tribe.

Uckewallists, ŭk-ĕ-wol'ĭsts, a religious sect so denominated after the name of its founder, Uke Walles, native of Friesland, who in 1637 published his opinions regarding human salvation. He taught the doctrine of Universalism, and held that the period between the birth of Christ and the descent of the Holy Ghost was one of profound spiritual darkness and ignorance, during which the Jews were deprived of divine illumination, and that therefore their rejection of the Messiah and their complicity in the Crucifixion would not be visited with the uttermost penalties by Divine Justice. After the death of the founder of the sect, the Uckewallists became merged in the Mennonite sect.

Uda, oo'dä, **Felice,** Italian poet and essayist, brother of Michele Uda (q.v.): b. Cagliari, Sardinia, 25 Feb. 1832. His writings include many critical and historical essays, the most important of which are: 'Dante and Modern Poetry'; 'Leopardi and Poerio'; 'The Heart and the Age'; 'Every-Day Saints'; and 'Miguel Cervantes.' His best known volumes of verse are: 'Wishes and Hopes' (1852) and 'Memories and Affections' (1862).

Uda, Michele, Italian dramatist: b. Cagliari 1830. He was the author of popular comedies, the most celebrated of which is 'The Renegados' (1858). His more serious plays, while not attaining the same popularity, were among the well-known dramas of the Italian stage in the latter half of the 19th century.

Udaipur, oo-dī-poor', India, (1) A northwestern town, capital of a native state of the same name in Rajputana, 70 miles west of Gwalior. It is finely situated beside a lake 2,000 feet above sea-level, contains a notable royal palace, and exports cotton, indigo, etc. Pop. (1901) 45,976. (2) The state (called also Mewar), with an area of 12,670 square miles, came under the protection of Great Britain in 1817, and the raja ranks highest in dignity among the Rajput chiefs. Pop. (1901) 1,021,664.

U'dal, the name of a system of land tenure common in northern Europe before the feudal system. It is now preserved in Orkney and Shetland. The tenure was completed by undisturbed possession and provable by witnesses before a court. Though dependent on the crown the incumbent pays only a slight tax known as skat. The tenure has been held by the English court of sessions to be equivalent to allodia; and the lands under it have been generally converted into fens.

Udall, ū'dal, or **Uvedale, Nicholas,** English scholar and dramatist: b. Hampshire 1505; d. London 23 Dec. 1556. He was educated at Winchester and Corpus Christi College, Oxford, from which he was graduated in 1524. He is said to have imbibed Lutheran opinions and to have been on this account prevented from getting his M.A. degree till 1534. He now became headmaster at Eton, a post which he held till 1541, when he was dismissed. He continued, however, to hold till 1544 the vicarage of Braintree to which he had been appointed in 1537, and he gained the favor of Catharine Parr, queen of Henry VIII. Under her patronage he translated part of Erasmus' 'Paraphrase of the New Testament.' He was also in high favor at the court of Edward VI., and held more than one benefice. On the accession of Mary he continued to maintain himself in favor, and from 1554 till shortly before his death was headmaster of Westminster. Udall is now only remembered by his comedy 'Ralph Roister Doister,' a somewhat rude work in rhymed verses licensed in 1566 but probably written as early as 1540 and acted by the boys of Saint Mary's College, Eton. Several editions of this earliest of English comedies have since appeared, among them one in Arber's 'Reprints' (1869) and one in Dodsley's 'Old Plays' (1874).

Udine, Giovanni da, jō-vän'nē dä oo-dē'nĕ, Italian painter: b. Udine, Northeast Italy, 1487; d. 1564. He was originally a pupil of Giorgione at Venice and there did much decorative work. Afterward he was associated with Raffael in frescoing the loggias of the Vatican and the Villa Farnesina. His work here completed, he returned to Udine in 1527 and painted many pictures for that city and neighboring places, executing the frescoes in Colloredo castle. He also furnished the designs for the stained glass windows in the Biblioteca Laurenziana at Florence.

Udine, North Italy, capital of the Udine province, 60 miles northeast of Venice, forms a kind of double town — an outer and an inner — both surrounded by walls. It contains a castle

(now barracks) on an eminence, a cathedral, archbishop's palace, museum, technical institute, etc. The silk industry is important, and there is a considerable trade, especially in flax and hemp. Pop. (1901) 37,933.

Ueberweg, ü'bĕr-vĕg, **Friedrich,** German philosophical writer: b. Leichlingen, Rhenish Prussia, 22 Jan. 1826; d. Königsberg, Prussia, 9 June 1871. He was educated at Göttingen and at Berlin, and in 1862 became extraordinary professor at Königsberg. He was appointed to the chair of philosophy there in 1867 and remained in that position until his death. He published: 'System der Logik und Geschichte der logischen Lehren' (1857); 'Ueber die Echtheit und Zeitfolge der Platonischen Schriften' (1861); 'Grundriss der Geschichte der Philosophie' (1863); etc. Consult Lange, 'Friedrich Ueberweg' (1871); Brasch, 'Die Welt und Lebensanschauung Friedrich Ueberweg's nebst einer biographisch - historischen Einleitung' (1889).

Ufa, oo'fä, Russia, (1) Capital of the government of the same name, on the Bielaya, at the confluence of the Ufa, 735 miles east by north of Moscow. It is defended by a citadel; is the see of a bishop, and has a number of handsome and regular streets, and considerable manufactures and trade. Pop. (1897) 49,961. (2) The government was separated in 1865 from Orenburg; area, 47,185 square miles. On the east, where it is bordered by the Southern Urals, the country is mountainous, wooded, provided with excellent pastures, and rich in minerals. It is well watered by the Bielaya, with its tributaries, and has abundance of good arable land. To the west of the capital the country becomes flat, and to the south steppes prevail. Pop. (1897) 2,220,497.

Uganda, oo-gän'dä, British East Africa, a British protectorate lying north of Lake Victoria Nyanza, and bounded on the north by the 5th parallel of north latitude, on the east by Lake Rudolph and the British East Africa Protectorate, on the south by German East Africa and Victoria Nyanza, and on the west by the Kongo Free State. It consists of the native kingdom of Uganda and several other districts with a total area of about 80,000 square miles. The surface is diversified and well watered by headstreams of the Nile and of a number of lakes, including Rudolf, Victoria, Albert, and Albert Edward Nyanza, all of which lie partly within the protectorate. The flora and fauna are extremely rich and the soil very productive. Iron is abundant, and copper and gold are also found. The chief exports are ivory, timber, rubber, and cattle. The inhabitants are chiefly Bantu tribes. The Baganda tribes, the foremost among them, are civilized and Christians, with a well ordered native government under the supervision of a resident British commissioner. The capital is Mengo. Uganda came under British influence in 1890, and parts of the territory were for a time administered by the British East Africa Company. In 1894 the kingdom of Uganda was declared a British protectorate, and the area was gradually extended to the present limits. Pop. 4,000,000.

Ugolino, oo-gō-lē'nō **(della Gherardesca,** della gā-rär-dĕs'kä), Count of Donoratico, Italian leader: b. Pisa about 1220; d. there March 1289. He was one of the leading Ghibellines of Pisa (see Guelfs and Ghibellines), but, with the purpose of obtaining supreme power in the Pisan republic, entered into a conspiracy with Giovanni Visconti, head of the Guelfs. Banished by his own party, he was later allowed to return. When subsequently Pisa was threatened by the Genoese under Oberto Doria, Ugolino was appointed to command the defense. In the battle of Meloria, 6 Aug. 1284, he fled, thus deciding the contest overwhelmingly in favor of the Genoese. Treachery on this occasion has been generally imputed to him, but it has also been asserted that there is no adequate evidence for this view. However that may have been, the Pisans now granted Ugolino his opportunity, and by naming him capitano and podestá, at first for one year and later for 10 years, made him practically dictator of the state, Lucca and Florence joined Genoa for the spoliation of Pisa, but Ugolino, not without extensive cessions of territory, drew them from the alliance. More fully to obtain the confidence of the Guelfs, he made Nino Visconti associate-podestá. The latter, however, plotted with the Archbishop Ruggiero Ubaldini for Ugolino's overthrow. In July 1288 he was besieged in the Palazzo del Popolo, and compelled to surrender. His death by starvation in prison was related by Dante, who, in a passage to which Ugolino owes most of his fame, places him above the Archbishop Ruggiero on the inward margin of the second division of the lowest (ninth) circle of the Inferno. The narrative was paraphrased by Chaucer ('Monk's Tale'), and translated by Medwin with the assistance of Shelley (see appendix to Dowden's edition of Shelley). Consult Del Noce, 'Ugolino della Gherardesca' (1890).

U'grian, a term used in ethnology and comparative philology with somewhat different denotations. In ethnology it usually denotes a group of peoples of Mongolian stock extending from the rivers Ob and Ural in the east to the Baltic and the Danube in the west and south, and is thus an alternative name for Ugro-Finnish or Finno-Hungarian. In the science of language Ugrian, Ugro-Finnish, or Finno-Hungarian describes one of the great main branches of the Ural-Altaic (otherwise Turanian) group of languages. The Ugrian languages have no grammatical gender, and cases of nouns denoting locality are richly developed. Possessive suffixes take the place of our possessive pronouns. The verb has in general but two tenses, one for completed and the other for uncompleted action. Some of the Ugrian languages, such as Hungarian, have an objective conjugation of the verb, in which the personal object is expressed by a suffix. Most of these languages have a special negative conjugation, in which the negation is conjugated while the verb remains unaltered. See Finns and Hungary.

Uhde, Fritz von, German painter: b. Wolkenburg, kingdom of Saxony, 22 May 1848. For a while a student in the Dresden Academy, he left the institution to enter the Saxon army, in which he fought during the Franco-Prussian war and became captain of cavalry. He resumed art at Munich (1877), but soon went to Paris, where he was a pupil of Munkácsy. After a period of genre-work in the old Dutch style, he turned to sacred subjects, abandoning mod-

ern artistic traditions in that field, and presenting his themes in a contemporary guise, somewhat after the fashion of the mediæval painters. This, together with a certain dulness of composition, long prevented the recognition in many ways due him. His pictures, however, found their way into many German galleries; he obtained several distinctions, including a Munich professorship; and his ideas influenced considerably the trend of German art. Among his works are: 'Come Lord Jesus, Be our Guest' (1885; National Gallery, Berlin); 'The Last Supper' (1886); 'The Sermon on the Mount' (1887); 'The Organ-Grinder's Arrival' (1883); 'Drum-Practice' (1883); and a 'Last Supper' (1897) for the Stuttgart Museum. Consult the monograph by Von Ostini (1902).

Uhl, ool, **Edwin Fuller**, American diplomat: b. Rush, N. Y., 14 Aug. 1841; d. Grand Rapids, Mich., 17 May 1901. He removed with his parents to Michigan in 1844, was graduated from the University of Michigan in 1862, and was admitted to the bar in 1864. He was prosecuting attorney for Washtenaw County in 1871–2, and in 1876 removed to Grand Rapids, where he engaged in law practice until his election as mayor of that city in 1890. He was re-elected in 1891, and in 1893 he was appointed assistant secretary of state. While *de facto* secretary of state during the illness of Secretary Gresham he was entrusted with the arbitration of boundary between Brazil and the Argentine Republic. He was ambassador to Germany in 1896–7 and then resumed his law practice.

Uhland, oo'länt, **Johann Ludwig**, German lyric poet: b. Tübingen 26 April 1787; d. there 13 Nov. 1862. He studied jurisprudence at Tübingen and was for a time an advocate at Stuttgart, subsequently giving his attention to linguistic pursuits. His earliest poetry dates from 1800 and the first collection of his poems appeared in 1815. In this year also he began to attract attention as a patriotic song-writer in connection with the political changes of the day, particularly those affecting his native state of Würtemberg, 'Vaterländische Gedichte' appearing in 1816. In 1818 his tragedy, 'Ernst, Herzog von Schwaben,' appeared, and in 1819 another drama, 'Ludwig der Baier.' His fame, however, rests on his songs and ballads, several of which are among the most renowned in German literature, and are well known in this country through translations by Longfellow. In 1819 he was elected by his native town of Tübingen, and later by Stuttgart, to the assembly of the states of Würtemberg, and in 1830 was appointed extraordinary professor of German languages and literature at Tübingen, but resigned this appointment in 1833 to take his place as a representative in the assembly. In 1848 the electoral circle of Tübingen elected him their representative in the German National Assembly. Among his antiquarian works are 'Ueber das altfranzösische Epos' (1812); 'Ueber Walther von der Vogelweide' (1822); 'Ueber den Mythus der Nordischen Sagenlehre vom Thor' (1836). An edition of his poems, together with his life, was published at Stuttgart in 1863. Consult: Jahn, 'Ludwig Uhland' (1863); Notter, 'Ludwig Uhland' (1863); 'Ludwig Uhlands Leben, von seiner Wittwe' (1874); Fischer, 'Ludwig Uhland' (1887); Diederich, 'Uhland als Dichter und Patriot' (1886); Paulus, 'Ludwig Uhland und seine Heimat' (1887).

Uhlans, oo'lans or ū'lans, a variety of light cavalry introduced into central Europe by the Tartars. They were armed with sabre, lance, and later with pistols. Just under the point of their lances hung a gaily colored cloth, meant to frighten the enemy's horses; the lance itself was carried in the left hand and attached by a strap under the left shoulder. The Uhlans were adopted from the Tartars by the Poles, Austrians, Russians, and Prussians. The last named nation used them with great effect in the Franco-Prussian war, in which they won brilliant victories by their bravery and marvelous activity.

Uhrich, ü-rēk (Ger. oo'rĭH), **Jean Jacques Alexis**, French soldier: b. Pfalzburg, Lorraine, 15 Feb. 1802; d. Passy, France, 9 Oct. 1886. He was educated at the military academy of Saint Cyr, France, and in 1823 served in the campaign in Spain. He subsequently served in Africa, was appointed brigadier-general in 1862, and in the Crimean war became general of division. In 1862 he became grand officer of the Legion of Honor, and at the outbreak of the Franco-Prussian war was assigned to the command of Strasburg. Notwithstanding the importance of the post it was inadequately garrisoned and fortified, but when the Germans demanded its surrender in August 1870 Uhrich refused. In the bombardment which followed the Germans hurled 200,000 balls and shells into the city, yet its commander stoutly resisted the siege until 27 Sept. 1870, when, convinced of the impossibility of holding the city, he surrendered. His defense won high praise from the German officers and in recognition of his services he was awarded the Grand Cross of the Legion of Honor. He wrote: 'Documents relatifs au Siège de Strasbourg' (1872).

Uhrichsville, ū'rĭks-vĭl, Ohio, city in Tuscarawas County; on the Stillwater Creek, and on the Pittsburg, C., C. & St. L. and the Cleveland, L. & W. R.R.'s; about 100 miles south of Cleveland and the same distance northeast of Columbus. It was founded in 1833 and was called at first Waterford; the name was changed to Uhrichsville in 1839. It is in an agricultural and stock-raising region, and in the vicinity are deposits of clay. The chief industrial establishments are connected with clay products as brick, drain-tile, and sewer-pipe. There are extensive shipments of clay products, wool, and farm and dairy products. The city has six churches, a high school, public graded schools, and a school library. There are two banks. Dennison, an adjoining village, is practically one with Uhrichsville in commercial and industrial matters. Pop. (1890) 3,842; (1900) 4,582.

Uintahite, ū-ĭn'ta-hīt, a very pure and highly lustrous variety of asphaltum from the Uintah Mountains, Utah. See GILSONITE.

Uintatherium, ū-ĭn-ta-thē'rĭ-ŭm, one of the huge horned ungulates of the group *Amblypoda*, fossil in the Eocene strata of the Uinta Mountains of northeastern Utah, whence the name "Uinta-beast" is derived. They were massive, five-toed, rhinoceros-like animals, with heavy heads, an ample dentition, with very large canines, like short tusks, from the upper jaw, and four or more pairs of horns upon the skull, sup-

ported by large cores. Closely allied were *Tinoceras, Coryphodon,* etc. See DINOCERATA.

Uist, wĭst, **North** and **South,** Scotland, two islands in the Hebrides, south of Harris, and separated from each other by the island of Benbecula. See HEBRIDES.

Uitlanders, oĭt'lăn-dẽrz, or **Outlanders,** the name given by the Boers, prior to the South African war, to the foreign residents of the Transvaal, the majority of whom were British subjects attracted by the discovery of gold in 1886. The refusal of the Transvaal government to give them the franchise resulted in the extinction of the South African Republic. See SOUTH AFRICAN WAR; TRANSVAAL COLONY.

Ujiji, oo-jē'jē, or **Kavele,** German East Africa, a town in the Ujiji district, situated on the northern part of the east shore of Lake Tanganyika. It is the principal trading post on the lake, and a station for steamers. It was here that Stanley found Livingstone in 1871. Pop. 8,000.

Ujjain, oo-jīn', India, a town in Gwalior, on the Sipra, 350 miles northwest of Bombay. It is six miles in circumference, surrounded by a stone wall with round towers. It is the ancient capital of Malwa and contains Scindia's palace, a poor edifice. It has a considerable trade in opium, etc. Pop. (1901) 39,892.

Ujvidek, ooy'vē-dāk, Hungary. See NEUSATZ.

Ukase, ū-kās', a Russian term applied to edicts whether legislative or imperial. The term is not extended to the orders of the ministers. Ukases have the force of laws until annulled by subsequent edicts and many such orders are issued in the course of one reign. In 1827 Emperor Nicholas had the great mass of accumulated ukases collected, collated, and codified. This code, published in 48 volumes, with the modifications of subsequent ukases codified annually, forms the body of the Russian law, and is called the svod. Imperial orders for a day such as military orders during a campaign are called prikases.

Ukiah, ū-kī'a, Cal., city, county-seat of Mendocino County; on the Russian River, and on the San Francisco & North Pacific railroad; about 120 miles northwest of San Francisco. It was founded in 1857. It is in an agricultural and stock-raising region. The industries are connected chiefly with the cultivation and shipment of farm products, hops, and fruit. Considerable lumber and live-stock are shipped to other markets. The educational institutions are a high school opened in 1893, three public schools, and one parish school. It has one state bank, which has a capital of $250,000, and one private bank. Pop. (1890) 1,627; (1900) 1,850.

Ukraine, ū'krān or oo-krān' (from the Russian and Polish *ukraïna,* "the frontier"), the local name for the extensive frontier region between Poland and Russia, now forming the Russian governments of Kief, Chernigof, Podolsk, Kharkof, and Poltava. It is watered by the Dnieper, which intersects it in a winding course from north to south.

Ula'dislas, kings of Poland. There were seven monarchs of this name.

Uladislas I.: b. 1043; d. Plosk 1102. He succeeded his brother, Boleslas, in 1081; his reign was disturbed by civil war and foreign campaigns.

Uladislas II.: b. 1104; d. Germany 1158; succeeded to the throne in 1138, was deposed 1146, and died in exile.

Uladislas III.: d. Silesia 1231; was elected king 1202, and deposed in 1206 on account of his cruelties.

Uladislas IV.: b. 1260; d. 1333; surnamed LOKETEK; became master of the kingdom in 1296, was deposed by the states, and Wenceslaus elected in his room, 1300, but was restored on the death of the latter in 1305 or 1306. His son, Casimir III., called "The Great," succeeded him.

Uladislas V.: b. 1348; d. Grodek 31 May 1434; Grand-Duke of Lithuania, obtained the crown by marrying Hedwiga, daughter of Louis. He was succeeded by his son, Casimir IV.

Uladislas VI.: b. 1424; d. 1444; son of Casimir IV., was also king of Hungary.

Uladislas VII., son of Sigismund: b. Cracow 1595; d. Mereca 20 March 1648, and succeeded his father 1632. He had previously sustained a war with the house of Romanoff, and afterward, in 1633–4, he conquered the Turks and Tartars of the Crimea.

Ulcer is a suppurating sore produced by the destruction of some part of the living structure, leaving a hollow from which matter is discharged. Ulcers may be either internal or external. They may be arranged either according to the constitutional or specific disease from which they are derived, or according to the characters which they present. According to the first system ulcers are spoken of as healthy, inflammatory, strumous, etc.; while according to the second they are named irritable, chronic, sloughing, etc. A common, simple, or healthy ulcer is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface tending to cicatrization. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the borders is of a purplish blue tint where the young epidermis modifies the color of the healing granulations and within this the granulations have a deeper hue than those at the centre, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is healthy or laudable pus. The only treatment required is a little dry lint, if there is much discharge, or the water dressing, if the sore is comparatively dry. When the granulations are too luxuriant they must be touched with nitrate of silver and dressed with dry lint.

Inflammatory ulcers differ less than most kinds from healthy ulcers. They commonly arise from some trifling injury, such as a blow or slight abrasion of the skin, which to a healthy person would have done no harm. Their most common seat is on the lower half of the leg or shin. The surface is red and bleeds easily; the discharge is thin and watery; the edges irregular or shreddy; and the surrounding skin shows a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-fed, and overworked. Hence constitutional treatment, good diet, and

complete rest (with elevation of the limb) are here demanded in addition to water dressing or lead lotion applied warm. Senile ulcers usually present very little discharge, exhibit granulations of a rusty red tint, and are surrounded by a dusky red area. Nourishing food, wine, bark, and the mineral acids are here required, and opium in small repeated doses is often serviceable. The local treatment must be of a stimulating nature, and in bad cases strapping the leg daily, with a mixture of resin ointment and Peruvian balsam spread on strips of lint is recommended. Strumous or scrofulous ulcers usually occur as the consequence of scrofulous inflammation in the subcutaneous tissue or lymphatic glands. They most commonly occur in the neck, groins, cheeks, scalp, and the neighborhood of the larger joints. The discharge is thin and of a greenish-yellow tint. These ulcers are seldom very sensitive or painful. The general treatment must be that recommended for constitutional scrofula. Iodine in some form or other is the best local application. A poultice of bruised and warmed seaweed is a very popular remedy; but there is probably nothing so efficacious as tincture of iodine diluted with water till it causes only a slight discomfort, and applied three or four times a day.

Uleaborg, oo'lyĕ-â-borg, Russia, a town in the grand duchy of Finland, capital of a government of the same name, at the mouth of the Uleå, on the northeast shore of the Gulf of Bothnia, 498 miles by rail north of Helsingfors. It has some manufactures, and carries on a trade in timber, butter, grain, etc. Pop. (1899) 15,626.

U'lema, the learned, knowing, or wise: collective name of the body of theologians and legists in Mohammedan countries: the word is Arabic and the plural form of *alim*, learned, wise. The Ulema constitute the legal and judicial class and are interpreters of the Koran and of the laws derived therefrom: they are in Islam in a measure the counterpart of a hierarchy in a Christian monarchy, and are the principal check upon the irresponsible power of the sovereign. Every Mohammedan city has a body of Ulema, but the most renowned are the Ulema of Constantinople, of Mecca, and of the Azhar University of Cairo. The Ulema of Turkey have the best organization, and enjoy many privileges and immunities. The classes of scholars and officials among the Ulema are: the Imâms, or readers of the public prayers in the mosques; the Mûftis or doctors of the law, who act either as advocates or as assessors in the courts; the Kâdis or Mollas, who are the regular judges; they are subordinate to two Chief Kâdis, one for the European, the other for the Asiatic provinces: over them all presides the Sheikh-ul-Islâm, spiritual head, under the caliph, of orthodox Mohammedanism, and supreme judge of the Ottoman empire.

Ulex. See FURZE.

U'lexite, a mineral occurring in white, crudely spherical masses composed of fine fibres, having a silky lustre. It is very soft and light, its hardness being only 1, and specific gravity 1.65. It is a hydrous sodium and calcium borate, $NaCaB_5O_9.8H_2O$. It occurs in large quantities in Chile and Argentina, also abundantly in the salt marshes of Nevada and California.

Ul'filas, Ulphilas, or **Wulfilas**, bishop of the Goths: b. north of the Danube 311; d. Constantinople 381. He was consecrated bishop by Eusebius of Nicomedia, probably at Antioch, in 341; and though his native language was Gothic, he learned to speak and write Greek and Latin. Like all the Goths he was an Arian, and was called to Constantinople by the Emperor Theodosius shortly before his death to attend a conference or controversy on disputed matters of faith. His claim to renown is based upon the fact that he translated into his own tongue the whole Bible, with the exception of the Books of Kings, which he deemed too warlike for his inflammable Goths. He seems to have invented the Gothic alphabet, which is evidently based on the Greek. He employed the Septuagint for the Old Testament, and a Greek text, different from the received text, for the New. His translation is faithful, but not slavish. It was generally used by the Goths who migrated to Spain and Italy, but the Gothic language having died out in southern Europe it was entirely lost, and only some fragments have been preserved. These consist of the greater part of the Gospels and epistles of Saint Paul, fragments of Ezra, Nehemiah, and of a psalm. There are editions of Gabelentz and Löbe (1843–6), Heyne (1896), Balg (1891), etc. This Gothic work is of the highest importance to the student of philology. See GOTHIC; GOTHS.

Ulke, Henry, American painter: b. Frankenstein, Prussia, 29 Jan. 1821. He was educated in Breslau, and studied painting under Wach in Berlin (1842–6). In 1851 he came to the United States and established a studio in Washington, D. C., where he became well known as an admirable portrait painter. His sitters included President Grant, John Sherman, James G. Blaine, Secretary Stanton, Gens. Rawlins, Blair, and Spinner, Profs. Baird, Henry, Newcomb, and Bell, Lord Elgin, Sir F. Bruce, Earl Gray, and other eminent men.

Ulloa, ool-yō'ä, **Antonio de**, Spanish scientist and naval officer: b. Seville, Spain, 12 Jan. 1716; d. near Cadiz, Spain, 5 July 1795. He entered the navy when very young and in 1735 was appointed with Jorge Juan a member of the French scientific expedition to Peru. They were engaged for nine years in making surveys of the country, and in studying the history and social condition of the inhabitants, upon which they made a secret report to the Spanish government. This document is of great historical value as showing the abuses which later resulted in the Revolution and was later published in English under the title 'Secret Information Concerning America' (1826). Ulloa was captured by the British on his return trip in 1744, but was shortly released and returning to Spain became prominent among Spanish scientists. He founded the first metallurgical laboratory in Spain and also established the observatory at Cadiz. He was appointed to various political offices of importance, and in 1766–8 was governor of Louisiana. He published: 'Relación histórica del viaje á la América meridional' (1748); and 'Noticias Americanas' (1772).

Ulloa, Francisco de, Spanish soldier and explorer in the New World: d. about 1540. He accompanied Cortes (q.v.) in the conquest of Mexico, and was sent by that commander (July 1539) to explore the Gulf of California. With

three ships, one of which he lost in bad weather, he sailed from Acapulco for the Gulf. He was the first to establish the fact that Lower California is a peninsula. He ascended to the upper waters of the Gulf, explored the western coast of the peninsula, and reached, by some accounts lat. 30° 30′ N., by others only 28°. Statements as to his death are conflicting.

Ulm, oolm, Germany, town of Würtemberg, 45 miles south-southeast of Stuttgart, on the left bank of the Danube, and on both sides of the Blau, here crossed by five bridges. A bridge across the Danube connects with Neu-Ulm. It is a place of considerable strength, being provided with important defenses on both sides of the Danube. It is an old town, irregularly built, with narrow, winding streets. It has a cathedral in the old Gothic style, with spire 530 feet high, completed in 1890; manufactures of machinery, woolen and linen cloth, leather, paper, brassware, etc.; and an important trade. Ulm was long an imperial free town. It forms an important military position, and its possession has been keenly contested in every great European war. The capitulation of Ulm, 17 Oct. 1805, was the turning-point of the campaign of Austerlitz. Pop. (1900) 42,985.

Ulma'ceæ, a name formerly applied to a group of trees and shrubs of the order *Urticaceæ*, but later separated as a distinct family. The typical genus of this group is *Ulmus*, the elms, which have been described under the title Elm.

Ul'mann, Albert, American author and stockbroker: b. New York 2 July 1861. He was graduated from the College of the City of New York in 1881, and has been a member of the New York Stock Exchange from 1899. He has published 'Frederick Struther's Romance' (1889); 'Chaperoned' (1894); 'A Landmark History of New York' (1901); 'New York's Historic Sites' (1902).

Ulna. See Arm; Osteology.

Ulpianus, ŭl-pĭ-ā'nŭs, **Domitius**, Roman jurist: b. Tyre, Phœnicia, about 170 A.D. His public life at Rome began under Septimius Severus first as assessor to the prætor (Papinian), and afterward as *præfectus prætori* under Alexander Severus (222). He was murdered before the eyes of the emperor whose adviser and mouthpiece he had been, by the Prætorian guard which he commanded (228). He was a voluminous writer and extracts from his writings form one third of the 'Pandects' of Justinian, who makes 2,462 extracts from Ulpian. His chief works, 'Ad Edictum' and 'Ad Sabinum,' are only extant in fragments. Consult: Hugo, 'Tituli ex Corpore Ulpiani' (1834); and Abdy and Walker, 'The Commentaries of Gaius and the Rules of Ulpian.'

Ul'ric, Saint, German mediæval bishop: b. Augsburg about 890; d. 4 July 973. He was appointed bishop of Augsburg 923, and made a great reputation as a prelate and patriot. He retired from his see during his latter years and died in the habit and cell of a Benedictine. Consult, Gerhard, 'Monumenta.'

Ulrich, ŭl'rĭk, **Charles Frederic**, American artist: b. New York 18 Oct. 1858. He began the study of his profession at Cooper Institute and the National Academy. In 1879 he was awarded a medal at Munich, where he had been a pupil under notable artists for some time. He subsequently settled in New York, but in 1884 removed to Italy. His best known pictures include: 'In the Land of Promise'; 'The Glass Blowers'; 'The Wood Engraver'; 'The Carpenter'; 'The Waifs'; 'A Dutch Typesetter'; and 'Washing of Feet in the Venice Cathedral.'

Ulrici, ool-rēt'sē, Hermann, German philosopher and critic: b. Pförte, Saxony, 23 March 1806; d. Halle, Prussia, 11 Jan. 1884. He studied law, but from 1829 gave himself to philosophical study and became professor of philosophy at the University of Halle in 1834. He published 'Characteristics of Ancient Historiography' (1883); 'History of Poetic Art in Greece' (1835); 'Treatise on Shakespeare's Dramatic Art' (1839), a work much prized by Shakespearian students; 'On the Principle and Method of Hegel's Philosophy' (1841); 'Ground Principles of Philosophy' (1845); 'System of Logic' (1852); 'Glauben und Wissen' (1858); 'God and Nature' (1862); 'God and Man' (1866); etc.

Ul'ster, Ireland, the most northerly of the four provinces comprehending the counties of Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone, Area, 8,613 square miles. Pop. (1901) 1,582,826. See Ireland.

Ultima Thule, ŭl'tĭ-mạ thū'lē. See Thule.

Ultra Vires, ŭl'trạ vī'rēz, a law term originated in 1851 by Baron Bramwell in the case of "East Anglian Railway Company vs. Eastern Counties Railway Company" (11 Common Bench, 775). It denotes the act or contract of a corporation beyond the powers conferred upon it in its charter. It is variously applied to: its authorized acts performed in an unauthorized manner; its authorized acts performed by agents of the corporation unauthorized so to act; to positively illegal acts of the corporation; but most specifically to its contracts to perform acts for which it is unempowered in its charter. The general rule is that *ultra vires* contracts cannot be enforced, and any stockholder or creditor can bring restraining suits against the corporation.

Ultramarine, a beautiful and permanent blue pigment originally obtained by powdering and washing the rare mineral lapis-lazuli. It is now made by heating to bright redness mixtures of aluminum silicate (china clay or kaolin), sodium carbonate, sulphur, and charcoal, and washing, powdering, and sifting the product. It is supposed to be a compound of silicates and polysulphides. Largely used in dyeing, calico printing, in coloring soaps and as a paint pigment.

Ultramon'tane and **Ultramontanism**, terms used originally in France to designate certain policies, teachings, and tendencies favored by the Church *ultra montes*, across the Alps, and opposed to the interests of the Gallican Church: later, Ultramontanism was used to denote the whole theological system of the Church of Rome and the doctrine of the pope's infallibility. Since the Vatican Council Ultramontanism is no longer an issue within the fold of the Roman Catholic Church: by the decrees of that council the distinction between Ultramontanism and Roman Catholicism is done away. See also Religious Sects.

Ulugh Beg, oo'loogh bĕg (or **Beigh**),

Mongol astronomer: b. 1394; d. 1449. He was the grandson of Timûr, or Tamerlane (q.v.); governed western Turkestan as regent for his father Shah Rokh, while the latter was employed in regulating the affairs of the southern half of the empire, and succeeded in 1447 to the imperial throne on his father's death. He built at Samarcand an observatory where he prepared tables of the sun, moon, and planets, and compiled the first original star-catalogue since Ptolemy, re-determining the position of 992 fixed stars. This catalogue was edited in England by Hyde in 1665 ('Tabulæ Longitudinis et Latitudinis,' etc.) and by Baily in 1843 (Vol. XIII. of the Royal Astronomical Society's 'Memoirs').

Ulula'tion, the howling, shrieking and cries that are a characteristic symptom of certain morbid states of mind produced sometimes by great religious excitement, or resulting from hysteria. Such phenomena were frequent in the Middle Ages during the prevalence of mental epidemics involving great communities, and they are not rare in modern times in seasons of religious revival. The cries are mere shrieks, or they resemble or are imitative, of the cries of animals — the barking and howling of dogs, the mewing of cats. A notable case of this nervous affection was that of an Oxford family of five sisters who, subject to a hysterical disorder, howled or barked like a dog. About the same period, in France, a whole community of nuns, all at the same hours, and for several hours together, would mew like cats: the cat-concert did not cease till the nuns were threatened with flagellation by the police (Zimmermann, 'Solitude,' Vol. II.).

Ulysses, ū-lĭs'ēz (Gr. Ὀλυσσεύς, *Olysseus*, "the hater"; Lat. *Ulixes*), Greek hero. He was king of the island of Ithaca, son of Anticlea and Laertes. He sailed with 12 ships in the Greek expedition against Troy. During the Trojan war (q.v.) he was noted for his eloquence, sagacity, and prudence. He was therefore often chosen for the services of a spy. After Achilles' death, he received that chieftain's armor, the award driving Ajax mad. But he is best known through the series of adventures and misfortunes which the enmity of Poseidon compelled him to undergo during the ten years of his return to "far-seen rocky Ithaca." This return is the subject of Homer's 'Odyssey' (q.v.). Odysseus, according to Homer, was thrown upon the coasts of Africa, and visited the country of the Lotophagi, and of the Cyclopes, in Sicily. Polyphemus seized him, with his companions, six of whom he devoured (see POLYPHEMUS); but the prince, having intoxicated him and put out his one eye, escaped from the cave. Æolus, whose island he visited, gave him a bag of winds to carry him home. His companions opened the bag, the winds escaped, and they were driven back to the Island of Æolus. Again sailing onward he reached a land inhabited by cannibal giants, the Læstrygones, from whom he escaped with only one ship. Then he was thrown upon the island Ææa, where Circe changed his companions into swine. Subsequently he passed along the coast of the Sirens and escaped the monster Scylla (who seized some of his men, however) and the whirlpool Charybdis. In Sicily his companions killed the sacred oxen of the sun, for which Zeus destroyed his ship by lightning, and all were drowned except Ulysses, who swam to Ogygia, the island of the nymph Calypso, where for seven years he had to remain. The gods at last interfered, and Calypso suffered him to depart on a raft built by himself. Poseidon raised a storm and sunk his raft. Ulysses swam to the island of the Phæacians, where King Alcinous hospitably entertained him, and sent him home in a ship to Ithaca, after an absence of 20 years. He found his palace besieged by a set of insolent suitors for the hand of his wife Penelope. With the aid of his son Telemachus he put the suitors to death. A portion of his adventures forms the theme of Stephen Phillips' striking blank verse play 'Ulysses' (1902); and Tennyson's noble 'Ulysses' is also concerned with the life of the Greek hero.

Uma, oo'mä, in Hindu mythology, the consort of the god Siva. She is also usually designated under the names of Kâli, Durgâ, Devi (q.v.), Pârvati, Bhavâni, etc. This goddess is worshipped in various parts of India; but the text-book of her worshippers is the "Devimahatmya," or "the majesty of Devi" — a portion of the "Markandeya Purana," in which are detailed the martial feats of the goddess. These consisted chiefly in the destruction by her of two demons, Madhu and Kaitabha, who had endangered the existence of the god Brahman; in her victory over the demon Mahisha, or Mahishasura, who having conquered all the gods, had expelled them from heaven; and the defeat of the army of Chadna and Munda. She is often represented holding the severed head of Chanda in her hand, with the heads of his soldiers formed into a wreath about her neck, and their hands spread into a covering for her loins. The worship of Kali (the Black), to which the narrative (of her victory over Chanda and Munda) has given rise, is considered by the Hindus themselves as embodying the principle of "tamas," or darkness. She is represented as delighting in the slaughter of her foes, though capable of kindlier feeling to her friends. She is, however, styled the Black Goddess of Terror, frequenting cemeteries, and presiding over terrible sprites, fond of bloody sacrifices; and her worship taking place in the darkest night of the month. Max Muller develops the myth of Uma into one of those solar myths suggested to the primitive mind by the most familiar of astronomical phenomena.

Umatilla, ū-ma-tĭl'a. See SHAHAPTIAN INDIANS.

Umatilla River, Oregon, a southern affluent of the Columbia River, rising in the Blue Mountains, and after a west and northwesterly course of about 150 miles through Umatilla County uniting with the Columbia at Umatilla village on the boundary between Oregon and Washington. Pendleton, the capital of Umatilla County, is the chief town along its course.

Umbagog, ŭm-bā'gŏg, a lake, the greater part in New Hampshire, in Coos County, and part in Oxford County, Maine. It is about nine miles long and from one to one and one half miles wide. Its outlet is a short stream which enters Richardson Lake, in Maine. The scenery around Umbagog is most beautiful, and its waters are well stocked with trout and other fish. It is a favorite resort for sportsmen.

Umballa, ŭm-hăl'a, or **Ambála**, India. See AMBALA.

Umbellif'eræ, an order of herbs and a few shrubs popularly known as the parsley family. The species, of which about 1,500 have been described and grouped in approximately 200 genera, are most abundant in the North Temperate and Arctic zones. Many species are also characteristic of high altitudes in more equatorial latitudes. The most notable feature of the order is the arrangement of the flowers in umbels, which characterize nearly all the species. The umbels are often compounded, that is, they are composed of smaller umbels called umbellets. The leaves are sometimes simple but generally compound, and usually contain resinous substances (volatile oils) which are characteristic of the individual species and either give or assist in giving the plants their acrid or pleasant flavors. In some species these flavors are very disagreeable, as for instance, in asafœtida; in others pleasantly odorous, as in fennel and anise. These last two species and several others, such as parsley, caraway, coriander, and celery (qq.v.) are popularly used for flavoring culinary preparations, such as salads, soups, sauces, and dressings. The stems of celery have been greatly enlarged by cultivation, and are among the most esteemed salads both in America and Europe. Several umbellifers have become important root crops in temperate climates. Of these the parsnip and the carrot are the best known in America, but several others are cultivated in Europe, Asia and southern Africa. Some of these, such as skirret (*Sium sisarum*), and chervil (*Chærophyllum bulbosum*), are occasionally cultivated in American gardens. Many of the species, including those now cultivated as esculents, were formerly considered to have medicinal properties, but except in a few cases such as fennel and anise, they have been discarded and in these cases they are now used merely to disguise the unpleasant flavors of other drugs. Formerly, also, many were reputed harmful and even poisonous when eaten by man and animals. Among these was the parsnip. The ill repute has been completely dispelled in most cases, but still clings to celery and parsnip; the former being reputed poisonous to certain individuals; the latter at certain seasons. Some of the uncultivated species are still under ban in some sections of the country but not in others. Besides the genera mentioned, the following are among the most important: *Crithmum, Archangelica, Conopodium, Smyrnium, Levisticum, Eryngium,* and *Prangos.* Botanically the order has been found difficult to arrange satisfactorily. Coulter and Rose have described the American species; De Candolle, Koch, Sprengel, Engler and other Europeans have also devoted much attention to this large order.

Umber, an olive-brown earthy pigment that becomes redder when heated. This earth is found in several localities; the best variety has come for some time past from Cyprus and goes by the name of Turkish umber. Raw umber is of an olive-brown color, semi-opaque, perfectly durable in water or oil, and does not injure any other good pigment with which it may be mixed. It is essentially a mixture of oxides of iron and manganese with 13 to 14 per cent of silica, together with small amounts of lime, magnesia, alumina, water, etc. When highly heated all the water is drawn off, causing a change in the brown hydrated ferric oxide to red ferric oxide, and also increasing the percentage of red-brown manganese oxide. The pigment is now called burnt umber. Raw umber is not subject to adulteration, but a ferruginous peat or brown coal from near Cologne is sometimes substituted for it.

Umbil'ical Cord, the bond of communication between the fœtus (which enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein, lying in the centre of the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the veins convey arterial blood to the fœtus, and the arteries return venous blood to the placenta. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of cord dying away. See OBSTETRICS.

Um'bra, the Latin word meaning shadow, was for the ancient Romans a person who attended a feast uninvited by the host but as companion of one that was invited, whom he followed as his shadow; this parasite's duty was to laugh at the jokes of his patron. In astronomy the black central portion of a sun-spot was first called umbra by Dawes; he limited the designation nucleus to the patch of deeper blackness sometimes noticed in the umbra, though the whole of the darker area is often called nucleus: The fringe of lighter shade surrounding a sun-spot is called penumbra. In ichthyology, the solitary genus *Umbridæ* comprises two species: *U. krameri,* a small fish three or four inches long, found in stagnant pools in Austria and Hungary; and *U. limi,* rather smaller, locally distributed in the United States; its common name is dog-fish or mud-fish.

Umbrella, as its name implies, an instrument for casting shade. They were introduced from Asiatic countries, where they are of great antiquity, and are used as protectors from the sun's rays, rather than from rain. They were brought to England from Italy in the early part of the 18th century, and later came into general use, being employed by ladies, but scorned by men as effeminate, until Jonas Hanway, an eccentric traveler, demonstrated its utility as a protection from rain. They soon came into universal use. The general construction of umbrellas has changed little in the thousands of years it has been known, the ancient Chinese patterns being adopted by the Europeans. Gloria or alpaca in the common grades and silk in the finer ones have been substituted for the oiled paper once used for the covering, while grooved steel ribs have taken the place of the bamboo, rattan, or oak ones. English manufactories control the largest output of the article and maintain a general excellence of quality.

The industry was introduced into the United States about 1800, but did not assume importance until 1865. At the present time the capital invested in it in this country is estimated at $3,000,000 and the approximate total of umbrellas manufactured at 9,000,000 per annum. American umbrellas excel in finish, neatness, and compactness.

Umbrella-bird, an extraordinary South American forest-bird (*Cephalopterus ornatus*) of the family *Cotingidæ,* which takes its name from

its remarkable crest of feathers, the shafts of which, according to Wallace, radiate on all sides, reaching beyond the tip of the bill and forming a dome or parasol about four inches in diameter. The resemblance of this ornament to a helmet-plume has led to the name "dragoon-bird." Another curious feature is a cylindrical fleshy process, an inch and a half long, pendent from the front of the neck, and clothed with overlapping feathers. This bird is about the size of a crow and glossy black with a blue gloss on the crest. It inhabits the valley of the Amazon. In the Andine region occurs a second species (*C. penduliger*) with a much longer dewlap; and in Central America a third (*C. glabricolis*) in which the throat and dewlap are naked, except at the tip of the latter, and colored orange-red. These birds feed on berries and fruits, and have a loud, clear song. Consult: Wallace, 'Travels on the Amazon' (London 1853); Newton, 'Dictionary of Birds' (New York 1896).

Umbrella-tree, in eastern America, the larger species of *Magnolia,* and especially *M. tripetala,* or elk-wood. The latter's great, thin, oval leaves are pubescent beneath, nearly two feet long, and half as wide, and radiate from the ends of the branches, in a manner suggestive of the protecting ribs of an umbrella. It is a tree from 30 to 40 feet tall, with irregular branches, and grows naturally in shady woods and in deep soil. The flowers are large and cup-shaped, with creamy tinted, thick petals, and reflexed petaloid sepals, and have a disagreeable odor. The tree, nevertheless, is sometimes planted for ornament, being completely hardy no farther north than Pennsylvania. The bark is slightly aromatic and tonic, but the wood is valueless. The ear-leafed umbrella-tree is *M. fraseri,* with auricled foliage and fragrant flowers. *M. macrophylla* is the great-leaved umbrella-tree. The pride-of-China-tree (*Melia azedarach*) has produced in the southwestern United States a variety, *umbraculifera,* which forms a regular, dome-shaped head like an open sun-shade, and is consequently to be added to the list of umbrella-trees. The Queensland umbrella-tree is the handsome araliaceous *Brassaia actinophylla,* a tree 40 feet high; that of Guinea is the *Hibiscus* (*Paritium*) *guineensis.* A screw-pine, *Pandanus odoratissimus,* is also known by this name.

The umbrella-pine, or parasol-fir, is a tall evergreen tree (*Sciadopitys verticillata*) from Japan, with a pyramidal habit. Its true leaves are reduced to minute scales, and its apparent glossy, dark foliage is composed of phyllodia, or stems assuming the functions of leaves, which are arranged in umbrella-like whorls on the branches.

Um'bria, Italy, one of the ancient divisions of the kingdom, lying west of Etruria, and north of the country of the Sabines, and corresponding approximately to the modern province of Perugia. It is usually described as extending from the Tiber east to the Adriatic; but when the Umbrians first came into history they were restricted to the ridges of the Apennines, the lowland region bordering on the Adriatic from the Æsis (Esino) to the Rubicon, being held by a race of Gallic invaders, known as the Senones. The Umbrians were subjugated along with the Etruscans, but joined the Samnites in their last gallant struggle against Rome, and were finally overthrown at Sentinum (295 B.C.).

Umlaut, oom'lowt, in philology, a modification of vowels; the change of the vowel in one syllable through the influence of an *a,* an *i,* or a *u* in the syllable immediately following. It is common in Teutonic languages — German, Scandinavian and Anglo-Saxon; traces of it remain in English, as in the plurals of man (men), brother (brethren), mouse (mice), goose (geese), etc. In German the umlaut is seen in the frequent change of *a, o* and *u* to *ä, ö, ü,* as *Mann, Männer; Sohn, Söhne; Kraut, Kräuter.*

Umnak, oom'näk, an island of Alaska, one of the Fox Islands, a group of the Aleutian Islands. It is about 66 miles long and 10 miles wide. On the east is Umnak Pass, five miles wide, which separates the island from Unalaska Island. The interior was explored, in 1757, by Nikiforoff, a Russian. The island is of volcanic origin, the highest point, Vsevidoff, is a volcano 8,000 feet high. Other peaks are also volcanoes. Just north, and connected with Umnak by a reef, is the volcanic island of Bogosloff which was thrown above water in 1796. On Umnak are many hot springs, in one part the springs are boiling. Near Deep Bay there are springs which vary in temperature. Fossil-wood, lignite, fire-clay, and different forms of lava are found on this island. The largest village, Nikolski, has about 300 inhabitants. The chief industries are catching seal and fishing.

Umpqua, ŭmp'kwâ, a small tribe of the Athapascan stock of North American Indians. They now number 86 and are on the Grande Ronde reservation in Oregon.

Umritsir, ŭm-rĭt'sēr. See AMRITSIR.

Una, ū'na, in Spenser's 'Faerie Queene', the allegorical representative of Truth, which in this "lovely ladie" shines forth in all its purity. By her gentle spirit she tames a lion (Reason), which accompanies her through her distressful wanderings. For her sake her companion, George, the Red Cross Knight, slays the dragon, and after a period of painful separation they are united in marriage.

Unadilla, ū-na-dĭl'a, N. Y., village in Otsego County; on the Susquehanna River, and on the Delaware & Hudson railroad, about 45 miles northeast of Binghamton and 93 miles southwest of Albany. It is in an agricultural region. The chief manufacturing establishments are a flour mill, creameries, machine shop, foundry, and a wagon shop. The educational institutions are Union School and Academy, ranked as a high school, opened in 1893, and elementary and primary schools. There is one bank. Pop. (1890) 1,157; (1900) 1,172.

Unaka Mountains, a southwestern division of the Appalachian system, sometimes called the Great Smoky Mountains. They extend southward near the western boundary of North Carolina and Tennessee. The elevation of the range varies from 3,000 to 5,000 feet. They are well covered with pine trees and the slopes present a very picturesque aspect.

Unalaska, oo-nä-läs'ka, an island of Alaska, one of the Aleutian Islands, and the middle one of the Fox Islands. Two Russians, Glottoff and Soloiroff, with a small party of ad-

venturers, lived several months on the island the winter of 1765–6. The Russians were cruel to the Aleuts and made them practically slaves. In 1824 the place was visited by Father Veniaminoff, who remained with the people, taught them many things, converted the greater number to Christianity, and devoted his life for their welfare. The island is often visited by whalers, sealers, and explorers. It was an administrative centre, and is still one of the important parts of Alaska. A naval rendezvous is at Captain's Bay, at the northeastern end of the island. The island is volcanic, the highest point, Makushin, 5,960 feet, smokes constantly and occasionally it sends out lava. The vicinity is often subject to earthquakes. At Iliulink the thermometer is rarely above 80° in summer or below zero in winter. The climate is too cool for much vegetation. Copper and iron abound. But few small animals are found. Caves have been explored, and the interiors show they were once used by a race who had some knowledge of household utensils and reed carving. The largest town, Unalaska, on Captain's Bay, is an outfitting station for ships passing to and fro from the Pacific to the Arctic oceans.

U'nami («people down the river»), an important division of the Delaware Indians of Pennsylvania, who occupied the Delaware River from the mouth of the Lehigh to the Delaware boundary line. They were sometimes referred to as the Turtle tribe, in allusion to one of their totems.

U'nau, the two-toed sloth. See SLOTH.

Uncanonical Hours, those hours in which it is not permitted by law in England to celebrate matrimony, namely, the hours before 8 A.M. and after 3 P.M., except the case where a special license has been granted. In the United States no such restriction is made by the law.

Unca'ria, a genus of climbing plants with hooked spines, of the order *Chinconiaceæ*, and natives of the East Indies and tropical America. See GAMBIR.

Uncas, ŭng'kas, Mohegan sachem; d. about 1680. He was originally a war chief of the Pequot nation, but about 1634 revolted from the Pequot sachem Sassacus, obtained the support of the English settlers, and so acquired dominion over the Mohegan territory. In 1637 he joined the English in the war against the Pequots, and received for his services another portion of the Pequot lands. He shielded many of the Pequots from the vengeance of the English when the war was over, and for this was for a time in partial disgrace with the authorities; but he was soon received again into so great favor with the whites that several attempts were made by different Indians to assassinate him. In 1643 he was victorious over the powerful Narragansett sachem Miantonomoh (q.v.) and in 1648 the Mohawks, Pocomtocks, and other tribes unsuccessfully made war against him. He was besieged in 1657 by the Narragansett chief Pessacus, and is said to have been relieved by Ensign Thomas Leffingwell. In reward for this service, it is said, Uncas gave to Leffingwell all the land now included in the site of Norwich, Conn. In 1654 Uncas was reproved for «rapacity and injustice» by a council of colonial commissioners. He was the ally of the English in all the wars against the Indians during his life, though in King Philip's war he was too old to be of much active service. In 1842 a monument was erected in his honor at Norwich. Consult: Drake, 'The Book of the Indians of North America' (1834); Stone, 'Uncas and Miantonomoh, a Historical Discourse' (1842). See COLONIAL WARS IN AMERICA.

Uncial Letters. See PALÆOGRAPHY.

Uncle Remus, a plantation negro, the assumed narrator of plantation and folklore stories collected by Joel Chandler Harris in such books as 'Uncle Remus: His Songs and His Sayings' (1880); 'Nights with Uncle Remus' (1882); 'Uncle Remus and His Friends' (1892); etc.

Uncle Sam. See NATIONAL NICKNAMES.

Uncle Tom's Cabin, a novel by Harriet Beecher Stowe. This world-famous story was written in 1851, and appeared originally, from week to week as written, in the 'National Era,' an abolition paper published at Washington. Brought out in book form, when completed as a serial, its popularity was immediate and immense. Its influence during the last decade of slavery was great, and its part in the creation of anti-slavery sentiment incalculable. Prior to the close of the year 1852 it had been translated into Italian, Spanish, Danish, Swedish, Dutch, Flemish, German, Polish, and Magyar. There are two Dutch translations and 12 German ones, while more than 20 dramatizations have been made of it.

Uncleanness, Ceremonial, in various religious systems the lack of ritual purity or fitness. In the Brahmanic system food cooked by a Sudra or by an outcast is unclean to the Brahman; he loses caste if he eats of it; and he contracts ceremonial uncleanness if he consorts with unclean persons, as the Pariah, the Mahar, or other outcasts. The heretical law of Judaism pronounced certain animals unclean and therefore not to be eaten. Of animals that «chew the cud» all might be eaten, with exception of four; but of the four excepted — the camel, coney, hare, and swine — the first only is of the class of the ruminants. Among birds declared to be unclean are the eagle, ossifrage, vulture, kite, etc., of which several cannot be positively identified; but at all events the birds of prey are certainly included among the unclean birds, while most of the grain-feeding birds are allowed as articles of food. Among fishes or aquatic creatures those are unclean which have neither fins nor scales. Except the leaping orthoptera — locusts, grasshoppers, etc.— most insects are unclean, as also all creeping things, from vertebrate reptiles to molluscous snails. And not merely were unclean animals to be rejected as food, their carcasses were to be avoided, and whoever touched them became thereby unclean. The laws of ceremonial uncleanness were never of obligation in the religion of Jesus Christ, who taught that «not that which entereth into the mouth defileth the man; but that which proceedeth out of the mouth, this defileth the man»; and with regard to persons, Saint Peter, after the vision of the sheet let down, would no longer call any man common or unclean.

Unconformity, in geology, is a term commonly used to describe a discordant relation of

the strata of two groups to each other. We may conveniently distinguish two types of unconformity,— structural and stratigraphic. In structural unconformities the later or newer strata rest upon the more or less truncated edges of the older. The sequence of event implied here is: 1st, folding of the older strata, after their deposition, and their conversion from sea-bottom to land; 2d, erosion of the folded strata, until the folds have been truncated by a more or less perfect erosion plane; 3d, subsidence, and deposition of the later strata upon this plane. The more intense the folding, and the more perfect the erosion surface on which the later strata are deposited, the longer is generally the time interval represented by the unconformity. Thus on the Hudson River, the Ordovicic Hudson group of strata has suffered strong folding and more or less complete peneplenation during early Siluric time, before the Upper Siluric Manlius limestone was deposited.

A stratigraphic unconformity or hiatus is much less readily detected, because the strata have the same structural relations to each other. They appear perfectly conformable, nevertheless a great gap exists between them, in which a number of formations are represented. This type of unconformity indicates a change to land conditions, with probable erosion, but without folding after the deposition of the older strata, and a re-submergence of the surface and the deposition thereon of the later strata. Such an unconformity exists throughout the central part of the United States between the Siluric and Devonic and in many regions of the country between other formations. See STRATUM.

Unconscious Cerebration, in mental physiology, action by the mental faculties (or the cerebral organs), as of memory, reasoning, etc., performed without the mind being conscious of what it does till the results of this unconscious action present themselves in the centres for consciousness in the new ideas or new combinations of ideas which were evolved in the unconscious process. The theory of unconscious cerebration has been current among German metaphysicians from the time of Leibnitz and was systematically expounded by Sir William Hamilton.

Unconsciousness, a condition of little or no consciousness. The definition of consciousness (q.v.) has been given in another volume and it remains here to consider those degrees and kinds of deviations from ordinary conscious states, particularly in the subnormal depressions. Under unconsciousness may be grouped two or three types. There may be total abeyance, such as is seen in epilepsy, in sleep, in brain concussion, in severe injuries, in infectious diseases, in drugs, as anæsthetics, hypnotics, alcohols, etc. There may be subnormal conditions, semi-conscious, subconscious states which would properly be classed here, for in certain conditions, such as in some epileptics, some alcoholics, or hysterics, consciousness at one time may be acute and yet all memory of the former state may be obliterated in another condition. Some of these conditions are grouped under the heading of double personalities. Some of these represent true phenomena, the vast majority are frauds. Thus from the minor forms of "absent-mindedness" through sleep, up to the deepest grades of unconsciousness produced by drugs, one can observe in life all the many steps of a large variety of unconscious phenomena. The site of consciousness has already been discussed and its coexistence with the entire nervous system maintained, but clinically it appears under many exciting causes. The most important of these are:

Unconsciousness due to

1. Convulsions of unknown origin.
2. Epilepsy.
3. Hysteria.
4. Organic brain diseases.
5. Organic heart diseases.
6. Toxic causes — poisonings, endogenous and exogenous.
7. Traumatism.

(1) In childhood convulsions with unconsciousness come on from a large number of unknown causes. Fear, anger, high temperature, teething, worms, are some of the actual irritants in many of these instances; but in many no cause, immediate or remote, is to be found. Many of these attacks resemble attacks of epilepsy. They are to be carefully watched to determine this point, otherwise much harm may come, particularly if they are mild epileptic attacks and the epileptic habit be engendered by carelessness in treatment. Sometimes these convulsions leave permanent brain injuries, but the majority recover without serious after effects. Convulsions in a child of unknown origin should mean to the mother that the nervous system is very readily upset and special precaution should be taken to avoid all forms of excitement in such children.

(2) Epilepsy. The most common form of unconsciousness in epilepsy has already been discussed (see EPILEPSY), but there are in some epileptics minor alterations of consciousness, that are of much importance. In some epileptics the patient while not truly unconscious, yet may be so engrossed in a dominating idea, that all outside elements of attention are excluded. Thus some of this class may rob, murder, burn, roam off for days, or even weeks, and yet on their return to their so-called normal conscious state, they may be absolutely oblivious to all that has happened. Such states are not uncommon in epileptics, but they are very rare outside of this condition and hysteria.

(3) Hysteria (q.v.). In this disease unconsciousness is rarely complete. Consciousness is altered. These changes are fully discussed. Also see INSANITY; PARANOIA.

(4) Organic Brain Disease. A number of brain diseases may cause unconsciousness. The most common are meningitis, hemorrhage, thrombosis, embolism, tumors, organic dementias. Under the general term apoplexy is included three separate disorders, all of which have similar symptoms. These are hemorrhage, embolism, thrombosis. In the one, a blood-vessel in the brain breaks and there is destruction of brain tissue, in the second, a clot, usually from a larger blood-vessel, is swept into a smaller blood-vessel of the brain, cutting off the blood supply of a part of the brain. In a third a disease of the wall of the blood-vessel causes a local clot which fills up the vessel and in the same manner deprives a part of the brain of blood. In all of these conditions a "stroke," or apoplexy, with unconsciousness occurs. The individual symptoms may be consulted under apoplexy, hemorrhage of brain, embolism, etc.

In general paralysis of the insane, attacks of unconsciousness are a regular part of the development of the disease. See PARESIS.

(5) Some forms of heart disease are attended with fainting attacks. In these the valves of the heart are found to act in a defective manner. See HEART DISEASE.

(6) For a consideration of the toxic causes of unconsciousness see article on toxicology.

(7) Traumatism, such as blows on the head, severe falls, sunstroke, all give rise to unconsciousness. The two former conditions have been discussed under concussion — the last under sunstroke.

SMITH ELY JELLIFFE, M.D.,
Editor 'Journal of Nervous and Mental Disease.'

Uncovenanted Mercy, in theology, divine mercy or grace that is not promised by God in any covenant, and specially in the covenant of redemption. In accordance with this view, the extending salvation to those who have not had opportunity of hearing Christ, is now generally regarded by Protestant divines as part of a covenant on the part of God with those who believe in Christ, and is held to be an uncovenanted mercy. The Roman Catholic Church has never formally declared her teaching with regard to uncovenanted divine mercies; but by condemning certain propositions which deny that grace sufficient for salvation is given to none but those who believe in Christ, she has by implication approved the doctrine that "to all unbelievers, positive and negative (that is, who knowing of Christ have rejected him, and who have never known of him) there is given, according to the conditions of time and place, grace sufficient for salvation" (Perrone, *Prælect. Theol.*, Tract. *De Gratia*).

Unction, anointing with oil as a religious or semi-religious rite, is traceable back to the rudest form of nature worship. The pillars of stone or of wood that were the symbols of phallic worship, as the sacred stone in every village of certain parts of India at present, used to have oil poured on the top. The custom of pouring oil on sacred stones was not unknown to the Israelitish race (Gen. xxviii. 18, xxxi. 13). In the Mosaic ceremonial the use of unction is expressly prescribed for various occasions; among the Jews there was a holy anointing oil prepared with perfumes (Ex. xxx. 22–33) with which the priests, and the tabernacle with all its furniture were anointed: the kings also were installed in their office by unction; and the rite of unction was retained in the Christian Church, and their kings are installed in their office with unction. The usage was retained in the Christian Church, being employed in the administration of the sacraments of baptism, confirmation, order, in the consecration of altars, of sacred utensils, etc., and in the coronation of sovereigns. See UNCTION, EXTREME.

Unction, Extreme ("the last anointing"), one of the sacraments of the Roman Catholic Church as also of the Greek Orthodox Church; it is a sacrament in which the sick that are in danger of death are anointed by a priest for the health of soul and body; its divine origin and sacramental character are inferred from the passage James v. 14, 15. The "matter" of this sacrament is "oil blessed by the bishop"; but in the Greek Church the priests, commissioned by the bishop, bless the oil. The "minister" of extreme unction is a priest, not any cleric in inferior orders. The "subject" of the sacrament is a person that is dangerously sick. The "form" consists in the prayers pronounced by the priest in administering the unction; for example, at the unction of the eyes, the priest prays, "By this holy unction and through his most tender mercy, may the Lord forgive thee whatsoever sin thou hast committed by sight."

Under-tenant. See RENTS, LAW OF.

Underground Railroad, The, a term made common in the United States prior to the Civil War, denoting a secret method of conducting negro slaves from the Southern States to Canada and free States in the North. Between the Ohio River and the Great Lakes were many abolitionists who gave shelter and assistance to escaping slaves, and their homes were known as stations of the underground railroad. Among those who were patrons of the "underground" system were Wm. Lloyd Garrison, Wendell Phillips, T. W. Higginson and F. B. Sanborn. See ABOLITION.

Underground Railways. See SUBWAYS; TUNNELS AND TUNNELING.

Underground Russia, a noted work by Stepniak. The former editor of 'Zemlia i Volia' (Land and Liberty), who for many years hid his identity under the pseudonym of "Stepniak" (freely translated "Son of the Steppe"), wrote in Italian in 1881, this series of sketches of the revolutionary and Nihilistic movement in which he had taken such an important part. The introduction gives a succinct history of the individualistic propaganda which resulted in Russia in a certain measure of freedom for women, and which, at the expense of much suffering and many young lives sacrificed, spread a leaven of liberalism through the vast empire of the Czars. Stepniak traces the successive changes that have taken place in the attack on autocracy before and since 1871.

Underground Waters. See WATERS, UNDERGROUND.

Un'derhill, John, English colonist in America: b. Warwickshire, England, 1597; d. Oyster Bay, L. I., 1672. He served in the Netherlands and in 1625 in the Cadiz expedition, in 1630 was summoned by Winthrop to New England to train the inhabitants in martial discipline, and in 1634 was chosen from Boston to the Massachusetts assembly. In the Pequot campaign of 1637 he distinguished himself as commander of the New England contingent. His account of the war, 'Newes from America' (1638), was reprinted in the 'Collections' of the Massachusetts Historical Society (3d series, Vol. VI. 1837). Subsequently he was governor of Exeter and Dover, N. H., and held office in the colonies of New Haven and New York.

Underhill, John Garrett, American educator: b. Brooklyn, N. Y., 10 Jan. 1876. He was graduated from the Brooklyn Polytechnic Institute in 1894, later studied at Columbia, and has been assistant in comparative literature there from 1899. He has published 'Spanish Literature in the England of the Tudors' (1899).

Undertaker, a person employed to bury the dead; who furnishes coffins, caskets, hearses

and other necessary adjuncts to funerals and interments. In many parts of Europe at the present time coffins for the dead are supplied by carpenters and cabinet makers. This was the custom in colonial America and not until 1810 were there established coffin factories in this country. In 1847 there were about 40 coffin warehouses in New York. About 1850 it was seen that as every coffin required a lining, and as there were other fittings needed besides the wooden part, there might be a future for a house in this line dealing chiefly in trimmings and dry-goods. William Fernbacher entered upon the manufacture of robes and linings, and Adolph Tuska, who kept upholstery goods and cabinet-makers' supplies, imported some German-silver plated trunk-handles, which were used for coffins. This trade in handles rapidly increased in its proportions. The dry-goods part of the trade in New York in 1902 was in the hands of five firms, who manufactured nothing but the goods required by undertakers. The capital invested in the business in 1902 was $1,000,000; in 1875 it was $250,000. There are about 75 manufacturers of handles and plates in the country, and 200 manufacturers of coffins and caskets. Approximately, there are about a dozen manufacturers of embalming fluids and implements, half a dozen firms making hearses, and as many making coffin trimmings, such as fringes, cords, and tassels. There are also outside boxes of metal and slate, as well as hinges and springs. Taken altogether, the goods annually manufactured for funerals in the United States are valued at $20,000,000. Of this $8,000,000 worth are in dry-goods. Add to this sum the coffins made in remote districts, the profits and the work of the undertakers, and the hire of horses and carriages, the burial of the dead cannot cost less than $100,000,000 a year. There are over 5,000 funerals a day in the United States.

Un'derwood, Benjamin Franklin, American author and editor: b. New York 6 July 1839. At the outbreak of the Civil War he enlisted as a private in the Union army, was wounded and captured at the battle of Bull Run, and was not exchanged until 1862. He then became lieutenant and adjutant in the Rhode Island Heavy Artillery and served until the close of the war, acting in the meantime as war-correspondent for the Newport, R. I., 'News.' He was engaged in lecturing for 30 years after the war and in 1870–85 he was particularly prominent as an exponent of religious "free thought." He was business manager and co-editor of the Boston 'Index' in 1880–6 and in 1887 was engaged in a like capacity on the Chicago 'Open Court.' He edited the 'Illustrated Graphic News' in 1888, the 'Philosophic Journal' in 1893–5, has written editorially for the 'Free Thought Magazine' since 1893. He was secretary of the Psychical Science congress at the Columbian Exposition in 1893 and has published: 'Influence of Christianity on Civilization' (1871); 'Spencer's Synthetic Philosophy' (1891); 'Utilitarian Ethics' (1903); etc.

Underwood, Francis Henry, American author: b. Enfield, Mass., 12 Jan. 1825; d. Edinburgh, Scotland, 7 Aug. 1894. He was educated at Amherst College, studied law in Kentucky, and was admitted to the bar in 1847. He returned to Massachusetts in 1849, was appointed clerk of the State Senate in 1852, and in 1854 became literary adviser of the Boston publishing house of Phillips Sampson & Co. The establishment of 'The Atlantic Monthly,' by that firm was due to him and it was he who secured James Russell Lowell as editor-in-chief, Underwood being assistant editor. Two years later his connection with the periodical came to an end, and from 1859 to 1870 he was clerk of the supreme criminal court, Boston. He subsequently devoted himself to literary work till 1885, when he was appointed to succeed Bret Harte as consul at Glasgow, and while in Scotland he lectured on American literature. His term of office expired in 1889 and he returned to the United States for a time, but in 1893 was appointed consul at Edinburgh. He was the author of 'Handbook of English Literature' (1871); 'Handbook of American Literature' (1872); 'Cloud Pictures' (1873); 'Lord of Himself,' a novel of Kentucky life (1874); 'Man Proposes,' a novel (1880); 'The True Story of the Exodus,' an abridgment of the work of Dr. Brugsch-Bey (1880); biographies of 'Longfellow' (1882), 'Lowell' (1882), and 'Whittier' (1883); 'Quabbin' (1890); 'Dr. Gray's Quest' a novel (1896). His best work is seen in 'Quabbin,' a sympathetic study of life in a small New England town two generations ago. He had a wide acquaintance with books and men, possessed a fine critical sense and not a little literary power, but was to some extent lacking in constructive skill, and his personality was stronger than anything he ever wrote.

Underwood, John Cox, American soldier and civil engineer: b. Georgetown, D. C., 12 Sept. 1840. He was graduated as a civil engineer at the Rensselaer Polytechnic Institute, Troy, N. Y., in 1862, and served with distinction in the Confederate army during the Civil War, reaching the rank of lieutenant-colonel. For nearly a year he was held as a prisoner at Fort Warren. In 1870–2 he was mayor of Bowling Green, Ky., and during 1866–75 served as city, county, and consulting State engineer. From 1875 to 1879 he was lieutenant-governor of Kentucky. He was prominent in several secret fraternal organizations and Confederate patriotic societies; published many reports embracing plans for architectural and civil engineering works; and in 1896 was chosen superintendent and secretary of the Confederate Memorial Association.

Underwood, Lucien Marcus, American educator and botanist: b. New Woodstock, N. Y. 26 Oct. 1853. He was graduated from Syracuse University in 1877 and was professor of botany there 1883–91. Since 1896 he has been professor of botany at Columbia. He has published 'Systematic Plant Record' (1881); 'Our Native Ferns, and How to Study Them' (1881); 'North American Hepaticæ' (1884); 'Our Native Ferns and Their Allies' (1888).

Underwriter, one who insures, or makes a business of negotiating contracts of insurance. The term is particularly employed in connection with marine insurance. More recently it has come to be used in relation to certain modern financial conditions. Upon the organization of a corporation to absorb several companies, it is customary to raise a sum of money to be employed either as a working capital or for the

purchase of such stock in the companies as original holders are unwilling to exchange for the new securities of the corporation. The one employed in raising this sum is styled the underwriter. See INSURANCE; INSURANCE, LIFE, IN AMERICA; INSURANCE, MARINE; FIRE INSURANCE IN AMERICA; UNDERWRITING.

Underwriting, in finance, a method of floating the bonds and securities of large corporations by means of fiscal agents or syndicates. The general rule governing the underwriting of new securities is that the syndicates shall receive a commission of 5 per cent on the value of the securities underwritten. As an illustration take a railroad issuing $50,000,000 of bonds. The railroad, it may be presumed, is of good standing, and the security excellent. The company prefers, instead of securing a high premium on the bonds, to save in the annual interest charges. So it issues a 3½ per cent bond, with the probability that it will sell at par, or perhaps higher. The underwriters agree to take the entire issue, say at 98, but it charges a commission of 5 per cent, or about $2,500,000, for labor, expense and risk attending the operation. The railroad is now secure. It is assured of the money it needs, for which it has, indeed, paid a liberal discount, but no more liberal, proportionately, than would be required in procuring a modest loan in the ordinary market channels. The syndicate must now sell the bonds. If there is an active investment demand, it may be able to accomplish this at once, at a considerable advance over the underwritten price of 98. Suppose it sells at 102, the syndicate would then reap a profit of 4 per cent, or $2,000,000 in addition to the commission of $2,500,000, less, however the cost of advertising, wages, attorneys' fees and other incidentals. But if the demand were not as great as had been anticipated, the syndicate might find itself with millions of dollars of securities on its hands, for which it must pay, but for which there is no adequate market.

Undine, ŭn-dēn′ or ŭn′dēn, Ger. oon-dē′nĕ, a well known tale by De La Motte Fouque, published in German in 1811. Undine is a water sprite who becomes endowed with a soul upon her marriage with a mortal. This fanciful German tale is considered its author's masterpiece.

Undiscovered Country, The, a story by W. D. Howells, published in 1880. The central figure, Dr. Boynton, an enthusiastic spiritualist, is an admirable study of an honest charlatan. He has become a monomaniac on the subject of spiritualistic manifestations and, branded as a cheat, with his daughter seeks refuge in a community of Shakers, whose quaint and kindly ways are portrayed with a loving pen.

Undue Influence, a legal term of frequent use in testamentary suits, and sometimes in cases of contested elections. Undue influence in the making of a will is exerted when the testator is so unnaturally influenced that he makes his will in favor of some one other than his natural heirs,— undue influence being oftenest charged when the testator's mind was infirm or weakened by illness and his will was made while he was under the supervision of the outside beneficiary. Where undue influence is proved the court will set a will aside or allow compensation.

In voting, undue influence consists of force, violence, restraint, threat, or intimidation practised at the polls to influence votes to the way of thinking of the person making such demonstration. When proven it vitiates the result to the polling and lays the perpetrator open to penal action, with severe punishment.

Undulatory Theory of Light, or **Wave Theory of Light,** the theory which accounts for the phenomena of light and radiant heat, by interpreting them as the results of vibratory movements or undulations, in an all-pervading medium called the "ether" (q.v.). There are many optical phenomena which admit of a ready mathematical explanation in this manner, without making any very definite assumptions concerning the nature of the ether, or the kinds of motion that occur in it. In order to explain the phenomena of polarization, however, it is necessary to assume that when a light-ray passes through the ether, the ether is disturbed in such a manner that its particles oscillate back and forth in paths which are perpendicular to the direction in which the light-ray is traveling. In this respect the motion of the ether is very different from that which prevails in air when a wave of sound traverses that medium; the motions of the air particles in the case of a sound-wave being to and fro along lines that are parallel to the direction in which the wave is progressing. The motion of the ether when a light-ray traverses it is supposed, in fact, to be very similar to the motion by which a vibratory disturbance is propagated from one part of an incompressible elastic solid to another part; and for this reason the undulatory theory of light is often called the "elastic-solid" theory.

Christian Huyghens was the first to give the undulatory theory of light a definite form, and the origin of that theory may fairly be said to date from a paper written by him for the French Academy of Sciences, in 1678. Sir Isaac Newton was well aware of the possibility of accounting for many of the phenomena of light, by assuming that light consists of a kind of wave-motion in an all-pervading ether; but he objected to the undulatory theory, because he could not understand how a body could cast a sharp shadow if that theory were correct. He was of the opinion that the waves would necessarily sweep around obstacles, and close in behind them in such a way as to render sharp shadows impossible. Newton therefore adopted the alternative "corpuscular theory," which teaches that light consists of storms of tiny material particles, or "corpuscles," which tend, by reason of their inertia, to travel in straight lines. He developed this theory with characteristic power and ingenuity, so that physicists were long divided between his teachings and those of Huyghens. In 1801, Dr. Thomas Young, an English physicist, solved the difficulty which led Newton to reject the undulatory theory; for he showed that when the dimensions of an opaque object are very great in comparison with the wave-length of light, the light-waves which fall upon the object are prevented from sweeping around and closing up behind it, by means of the phenomenon known as "interference"; those waves which tend to pass around behind such an obstruction becoming compounded together in such a manner as to neutralize one another. Young's discovery stimulated

investigation so that within the next 20 years great advances were made in the development of the undulatory theory. Young and Fresnel, for example, explained the phenomena of polarization, and Fresnel developed his beautiful theory of the optical phenomena manifested by crystals. The objections raised by Newton had been entirely disposed of, and the undulatory theory had been placed upon an apparently firm foundation. Moreover, there are two things about the corpuscular theory which appeared to be absolutely fatal to it. The first is, that it does not lend itself readily to the explanation of interference. It is easy to understand that two waves in the ether may come together so as to neutralize each other; for an analogous phenomenon may be seen any day at the seashore, in ocean waves. It is not at all easy to understand, however, how two streams of light-producing corpuscles can produce darkness, when either stream alone will produce light. Another even more fatal objection to the corpuscular theory was, that this theory cannot explain refraction unless it is admitted that light travels faster in a dense medium than it does in a rarer one, while the undulatory theory requires that the light shall move faster in the rarer medium. Fizeau and Foucault proved by direct experiment that light travels faster in air than it does in water; and hence they proved that the corpuscular theory is not correct.

About the middle of the 19th century Michael Faraday published his experimental researches on electricity and magnetism; and while these did not deal particularly with light, it happened that they had a most important ultimate influence upon our views as to its nature. Maxwell, in studying Faraday's work and endeavoring to reduce his experimental results to a consistent mathematical theory, conceived the idea that light may be merely a periodic or vibratory *electrical* disturbance in the ether. Upon working out this idea in detail, Maxwell found that the new theory is free from many of the objections that had developed in connection with the older elastic-solid theory; and the "electro-magnetic theory" of Maxwell is now held by nearly all physicists, in preference to the older undulatory theory. The difference between the two is somewhat as follows: Maxwell agrees that light is some sort of a periodical disturbance in some sort of an ether, and he also agrees that the displacements that occur as the wave progresses are perpendicular to the direction in which the wave travels; but he teaches that these displacements are not analogous to those that are produced in an elastic solid when that solid is deformed. He considers that they are of an electrical nature, and that we must learn about them, not by observing the behavior of elastic bodies under stress, but by observing the phenomena exhibited by electrified bodies. In one sense, therefore, Maxwell's theory may still be regarded as a form of the undulatory theory; but the waves that are contemplated by it are electrical in nature, and are not strictly analogous to the waves in an incompressible elastic solid.

See ETHER; LIGHT; OPTICS. Consult, also, Preston, 'Theory of Light,' and Tait, 'Light.'

A. D. RISTEEN, PH.D.,
Editorial Staff, 'Encyclopedia Americana.'

Ungava, ŭng-gā'va, Canada, a northeastern territory formed in 1895, in the Labrador peninsula. It is bounded on the north by Hudson Strait, west by Hudson Bay and James Bay, south by Quebec, and east by the Atlantic. Area, 456,000 square miles. Ungava Bay, in the north of the district, opens into Hudson Strait. Pop. (1901) 5,113, mostly Indians.

Unger, ŭng'ẽr, **Frederic William,** American journalist: b. Philadelphia 25 Jan. 1875. He was educated at the Eastburn Academy, Philadelphia, and after studying for the ministry and for the bar, abandoned both for journalism. He was attached to Lord Roberts' headquarters as staff correspondent for the London *Times* during the South African war. He has published, 'With Bobs and Kruger' (1901).

Ungula'ta, a great and heterogeneous group of hoofed mammals which first appeared in the Eocene period as small marsh-dwelling forms scarcely distinguishable from the contemporaneous ancestors of the *Carnivora,* but which early became differentiated into several quite distinct series that have continued to diverge until in the living fauna they terminate in quite isolated groups. Under these circumstances it is not surprising that the opinions of zoologists differ greatly concerning the classification of these animals. Without considering the changes in classification that have followed increased knowledge of the living forms, it may be said that if the latter alone were considered they would fall naturally into three distinct groups; one typified by the horse, ox, pig, etc., another by the elephant, and the third by the coney (*Hyrax*). But with the great palæontological discoveries of recent years, especially in the Eocene of Wyoming and other Western States, and in the later formations of Patagonia, not only have these groups been connected by annectent forms, but several totally new types have been found, and generalized ungulates have been shown to intergrade with the *Carnivora* on the one hand and with the *Rodentia* and *Quadrumana* on the other. By some zoologists, as Cope, each of these principal groups, or radiating descent-series, has been given a distinct ordinal name. Others have grouped all together as a single order, with numerous subdivisions. As the latter arrangement is best adapted to the needs of the present article it is here followed.

In this broad sense the *Ungulata* have on each foot from one to five digits, terminated by broad, blunt nails or hoofs. With a very few exceptions among extinct primitive forms they are digitigrade and many of them walk on the very tips of the toes. The scaphoid and lunar bones of the wrist are always distinct. Well marked milk and permanent dentitions are always developed, and with a few exceptions these animals are strictly terrestrial and herbivorous. Evolution in this group has particularly affected the feet and teeth, with the other digestive organs. Correlated with the replacing of marshy forests by dry, grassy plains these animals increased in size and developed greater speed in running by a reduction in the number of digits from five to two or one, by the union of certain bones of the foot and lower leg, and by a change in the position of the carpal and tarsal bones, so that they alternate and interlock. As the soft succulent vegetation of the swamps

gave way to the wiry grasses of the plains the teeth gradually changed from a tuberculate low-crowned form to one with crescentic and then complexly-folded enamel ridges, and a high persistently growing crown. Although similar changes have been traced in many families, they are shown in greatest perfection in the horses, where every step in the evolution from the four-toed, low-tooth-crowned *Orohippus* of the Eocene, with well-developed ulna and fibula, to the one-toed, complexly high-crowned modern *Equus* with the greatly reduced ulna and fibula completely ankylosed with the radius and tibia respectively (See HORSE, EVOLUTION OF.)

A subdivision of all the *Ungulata* into *Ungulata Vera*, or true ungulates, and *Subungulata* is generally followed, though this, as indeed every sharp subdivision of the ungulates, is obscured by known fossil species. The *Subungulata* is a rather heterogeneous assemblage of the more primitive forms, in which the bones of the carpus and tarsus are not at all or only partially interlocking, the toes often five in number, and the feet sometimes subplantigrade. Some of the extinct forms have well developed clavicles. In the living species the mammary glands are, at least in part, situated on the breast, and the placenta forms a zone or broad band. Besides the many remarkable extinct groups placed by Cope in the orders *Taxeopoda* (*Condylarthra*), *Toxodontia* and *Amblypoda*, the *Hyracoidea* and *Proboscidea*, represented in the modern fauna by *Hyrax* and the elephants, belong here.

The *Hyracoidea* and family *Hyracidæ* comprise only a few species of small rodent-like animals of the genera *Hyrax* or *Procavia* and *Dendrohyrax*, inhabiting Africa, Syria, and Arabia. They present certain resemblances to the elephants on the one hand, and to the rhinoceroses on the other, but in most respects are quite isolated. The *Hyrax syriacus* is believed to be the "coney" of Scripture. The front feet have four, and the hind feet three toes, enclosed in hoof-like nails. No clavicles exist. The nose and ears are short, and the tail is rudimentary. No canine teeth exist, and the incisor teeth grow from permanent pulps like those of rodents. The placenta is zonary and deciduate, and there are six teats. The intestine is remarkable in having a large sacculated and a pair of small conical cæca. These animals live in burrows in rocky mountainous districts, while the species of *Dendrohyrax* are arboreal and live in hollows of trees.

The elephants (q.v.), although usually placed in a distinct order of mammals — *Proboscidea*, are related to the other ungulates through the *Hyracoidea* and *Amblypoda*. Each foot possesses five toes. There are no clavicles. The nose is prolonged to form a flexible proboscis, at the extremity at which the nostrils open. The testes are abdominal throughout life. The breasts are pectoral in position, and the placenta is non-deciduate and zonary. The canine teeth are wholly wanting, and the molars are few in number and are ridged or tuberculate on their crowns, very high and complex in structure in the specialized forms and appear in the jaws from behind, one at a time. The upper incisors grow from persistent pulps and form tusks. No lower incisors are developed in the elephants but existed in *Dinotherium* and some species of *Mastodon*. The extinct *Proboscidea* are of exceptional interest. The various species of mammoth, mastodon, etc., which belong to the family *Elephantidæ*, possessed enormous tusks curved nearly into a circle in the former, straight in the latter, and their remains are associated with those of early man. The *Dinotheriidæ*, remains of which are found in the Pliocene formation, possessed simple tuberculate molars and the lower incisors were greatly enlarged to form downwardly-turned tusks, on which account these animals were formerly associated with the walruses.

The *Ungulata Vera* (or *Diplarthra* of Cope) include the great majority of living ungulates, most of which are highly specialized in respect to foot and tooth structure. They never have more than four fully-developed toes on each foot; these toes being provided with hoofs, and are never plantigrade. No clavicles or collar-bones are developed, though transitory ones sometimes occur during fœtal life. The placenta, which is either diffuse or cotyledonary, is of the non-deciduate type. The molar teeth have broad crowns and vary in the different families. The mammæ or milk-glands of the female are usually few in number and placed in the groin; or more numerous and abdominal. The intestine is very usually provided with a large cæcum; and the stomach may be complex. Regarding the classification, a primary character is found in the number of the toes, with which many other characters are correlated. The section *Perissodactyla* includes those forms in which the toes are usually present in an odd number. The third or middle toe tends to predominate, while in the *Artiodactyla* the number is even and the second and third predominate. The dorso-lumbar vertebræ (that is, the vertebræ of the back and loins collectively) do not number less than 22. The dentition varies, but the premolars and molars are always similarly formed. The third digit or toe of each foot is symmetrical by itself, that is, does not form a pair with its neighboring digit. The thigh or femur bears a third trochanter. The stomach is of simple character, and the cæcum of very large size. The teats are inguinal in position and the placenta is diffuse. If horns are developed they belong merely to the epidermis, are not supported by a bony core, and are never paired in living forms. Where two horns exist (as in some rhinoceroses) the second is situated behind the first. Belonging to the perissodactylate *Ungulata*, besides many extinct Tertiary families, are three living ones typified by the tapirs, rhinoceroses and horses (qq.v.). The group is declining.

The *Artiodactyla*, or "even-toed" ungulates, are distinguished by the presence of either two or four toes, the third toe of each foot forming a symmetrical pair with the fourth. The premolar teeth, whatever their character, are always simpler than the molars. When horns are developed they nearly always exist in pairs, and are supported on bony "cores." The stomach is very complex in the ruminating forms, and the cæcum is small. The dorso-lumbar vertebræ number 19, and the femur wants a third trochanter. Unlike the *Perissodactyla* the *Artiodactyla* are a dominant group and, while in the early Tertiary times they were surpassed by the former in number and variety, they have steadily progressed as the lat-

ter have declined, and to-day are represented by about one third of the known families, very numerous genera and species and often vast numbers of individuals. The living families are arranged under the sections *Suina,* or pig-like *Artiodactyla, Tylopoda,* or camel-like *Artiodactyla, Tragulina,* the chevrotains, and *Pecora* or ruminants (qq.v).

Consult: Flower and Lydekker, 'Mammals' (London 1891); Lydekker, 'Wild Oxen, Sheep and Goats' (London 1898); 'Deer of All Lands' (London 1898); 'Great and Small Game of Europe, Asia and Africa' (London 1901); Bryden, 'Great and Small Game of Africa' (London 1899); Sclater and Thomas, 'Book of Antelopes' (London 1894–1900); Caton, 'Antelope and Deer of America' (Boston, 1881); Woodward, 'Vertebrate Paleontology' (Cambridge 1898); Marsh, 'Dinocerata' (Washington 1884); Cope, 'Organic Evolution' (Chicago 1896).

J. Percy Moore,
University of Pennsylvania.

U'nicorn, a fabulous animal, described in ancient accounts as a native of India, with the body of a horse but of larger size, and with one horn of 1½ to 2 cubits in length on its forehead, perfectly straight, with a white base, black middle, and red tip. The unicorn was adopted as a supporter of the royal Scottish arms, from which it has been introduced as the left supporter of the British arms, and has in this form been imported into India.

Unicorn-fish. See File-fishes.

Unicorn Plant, one of the popular names of plants of the genus *Martynia,* glandular, pubescent, and fetid herbs, natives of America. They have irregular funnel-form corollas, with oblique tubes, and limbs which are slightly two-lipped. The flowers are velvety, yellowish-white and purple-mottled, and borne in racemes on a decumbent stem possibly two feet long in the devil's horns (*M. louisiana*), common in the southwestern United States, and occasionally escaped from gardens. The leaves vary from ovate to orbicular, sometimes undulate at the edges, and the fruits are four-celled, 4 to 5 inches long, oblong, and prolonged into a curved point, much longer than the body. At maturity the rather fleshy, outer, green layer of the fruit disappears, and leaves the woody part of the pods, which ultimately splits into two valves, that are very tough and black, and sometimes as much as 13 inches long. These tapering horns are moistened and split by the Indian women of the Southwest, who weave them into their baskets, as the black element necessary in their color-scheme of decoration. The plant itself often serves as a motif for the design.

Unicorn-root, a graceful smooth plant (*Chamælirium luteum*) of the bunch-flower family. It has a tuft of radical spatulate foliage and stem-leaves which are narrow. The flowers are small and white, with a perianth of six segments, and are diœcious, in long racemes. The staminate racemes, nodding at first, eventually stand straight; fertile ones are always erect. The fertile plants are sometimes three feet high. The tuberous rootstocks are bitter, and an infusion of them is a popular tonic and anthelmintic, and is said to be a large ingredient of certain patent medicines. One of the industries of the mountaineers of the southern Alleghanies is that of digging up these roots. This *Chamælirium* is also known as devil's bit, or blazing star. The latter name being more generally and correctly applied to the stargrass (q.v.) (*Aletris farinosa*), which is a similar plant, having a bitter-tuberous rhizome.

Uniformity, Act of, in English Church history, the acts 13 and 14, Charles II., designed to regulate the terms of membership in the Church of England and in the colleges of the universities of Oxford and Cambridge. Both the Anglican (or Episcopal) and the Presbyterian parties had desired that their respective belief should be that of the established church, and Charles Stuart, who, as a step toward obtaining his father's throne, wished to stand well with both parties, promised, while still in exile at Breda, to use his influence to bring about a certain measure of comprehension. But the Parliament, which was overwhelmingly Anglican, was in no mood to favor such a scheme, and the Act of Uniformity which was passed required the clergy to sign the Thirty-nine Articles and to use the Book of Common Prayer. The enforcement of these regulations wrought the exclusion or the secession from the established church of 2,000 ministers and laid the foundation of modern dissent. Among the provisions of the Act of Uniformity was one which made actual receiving of the communion of the Anglican Church a condition precedent to the holding of public offices: this condition was abolished by the act 9, George IV., ch. 17; and in 1829 the Test Act of 1672, a supplement to the Uniformity Act, was repealed: that act excluded Roman Catholics from public offices. In 1871 the University Tests Act abolished subscription to the Articles, all declarations or oaths respecting religious belief, and all compulsory attendance at public worship in the universities.

Uniformitarianism, Huxley's name for the Lyellian doctrine of uniformity of geologic processes and results in all ages of the earth's history. In other words this doctrine teaches that the forces operative upon and within the earth to-day, were active in former geologic times, and produced the same results, and to them alone are due the structural features of the earth and not to catastrophic revolutions. See Huttonian Theory.

Uniforms, Military and Naval, are the particular dress and equipment assigned by proper governmental authority to the various grades of officers and men in the army and navy. As a rule the uniform consists of one prevailing color, variously ornamented and "faced" according to the rank and corps. It was not until the 14th century that the distinguishing dress of the military man was introduced in Europe. Since 1890 a remarkable similarity in color has been apparent among the army and navy uniform of the leading nations, blue being the prevailing color in the army and white in the navy. The distinguishing features of national uniforms are as follows:

Austria.— Light blue cloth tunics and gray trousers are generally worn in the Austrian army, the various regiments being distinguished by the head dress or the uniform facings.

France.— Uniforms were first officially worn

by the French soldiers in 1670. The cavalry wore white coats, leather breeches, plumed hats and high boots; the infantry white throughout with red facings. Later the cavalry wore blue and the dragoons green. In 1820 the general use of white was abandoned and blue became the vogue, and in 1843 a long gray coat was adopted. In 1903 a tunic of dark blue and trousers of dark gray with scarlet facings was adopted for the army. In the French navy the uniforms are similar to those worn in the United States.

Germany.— Infantry regiments in Germany wear dark blue tunics and trousers with scarlet facings. Saxon and rifle regiments wear green tunics with scarlet facings. The present day uniforms are not unlike those worn by the United States army. White is the prevailing color in the navy.

Great Britain.— Military uniforms in Great Britain may be said to date from the Restoration, and the consequent formation of a standing army. As early as Henry VIII.'s time the sovereign's bodyguard received a distinctive dress. But this dress was several times changed and cloth of gold and silver became red and yellow damask in 1529, and then white and black shortly afterward. The life guards and the horse guards, formed in 1661, were dressed in scarlet coats, feathered hats, and jack boots. Cocked hats were soon after given them, and in 1812 helmets. Somewhat similar changes have taken place in the rest of the army. Scarlet may be said to be the national uniform of the British army, but this only applies to the tunic or jacket, and there are many exceptions. Thus British artillery and many cavalry regiments wear blue, all rifle regiments green, some regiments of Indian army yellow, drab and French gray, some colonial and other volunteers gray. In hot climates, during summer, only white or buff uniforms are worn, and the white helmet is universal for European troops. The kilted dress of the Highlanders is peculiar to the British army, but the black soldiers of the less well-known West India Regiment are dressed like Zouaves, the jacket being red and trousers blue instead of the reverse. Generally all hussars and lancers wear blue, all other cavalry red tunics with blue overalls; but the 11th Hussars have crimson overalls, the 6th Dragoon Guards blue tunics and the 16th Lancers red. The Scots Grey and foot-guards wear bearskins, and all fusiliers hats of similar shape; hussars and horse artillery wear the Busby, kilted regiments the feather bonnet, Highland Light Infantry the shako; rifle regiments now a small astrakhan busby, staff-officers cocked hats. All others wear helmets, metal for cavalry, blue cloth for other arms; native Indian regiments generally turbans. Forage caps of various patterns are worn in undress. Facings, formerly very prominent, are now confined to collars, cuffs, the busby bags of hussar regiments, and the breast-pieces of lancers' tunics. Officers of all arms wear, in addition to other marks, badges of rank on their shoulder-straps. One star denotes a lieutenant, two a captain, a crown a major, a star and crown a lieutenant-colonel, a second star a colonel. Cross-swords added to these signify the various grades of general officer, and cross-batons a field marshal. The khaki (q.v.) cloth for uniforms was introduced in the British army during the Boer war 1899–1903. Uniforms in the British navy were not in vogue until the reign of George III. Like other nations, the prevailing color is blue. Tail coats and epaulets are still worn by officers in full dress, and cocked hats. Rings of gold lace and badges on the epaulets denote the rank.

Italy.— Like the French the Italian army uniform is of blue and gray, with yellow facings instead of scarlet. Blue and white are the prevailing colors in the Italian navy.

Japan.— In winter the Japanese wear uniforms of dark blue, and in summer khaki and white. The artillery facing is yellow, that of the cavalry green and of the infantry red.

Russia.— Green is the prevailing color in the Russian army with red piping at the collar of the tunic; no facing being worn in the infantry. The Cossack troops wear dark gray coats, gray trousers tucked in high boot tops, with high round caps made of sheepskin. The cavalry regiments wear red facings on the collar and sleeves. In the Russian navy the winter dress is blue; that of summer white.

Sweden.— Dark blue and green are the typical colors in the Swedish army, while white is worn in the navy. The officers of the Swedish navy are considered as military officers; and in full dress are obliged to wear spurs.

United States.— Blue is the uniform of the United States army, the overcoat and trousers sky-blue, the blouse and uniform dark-blue. The head-dress is a very distinctive part of the uniform. In the Cuban campaign and in Porto Rico and the Philippines, buff khaki superseded blue. The uniforms of the Confederates were gray. In the United States army the shoulder-straps of a second-lieutenant are plain, those of a first lieutenant bear a silver bar at each end, those of a captain two silver bars at each end, those of a major a gold oak-leaf at each end (silver for a lieutenant-colonel); a colonel's shoulder-straps bear a silver eagle, a brigadier's a silver star, a major-general's two and a lieutenant-general's three silver stars, and the general's two silver stars with a gold eagle and device between. In the United States navy dark navy-blue is the uniform color, but in warm weather a service coat of white linen duck trimmed with white braid is substituted, and a white cork helmet takes the place of the cocked hat or service cap. All commissioned officers wear gold bullion epaulets on each shoulder; rank is indicated by strips of gold-embroidered white oak-leaves or of gold lace, and by devices on the shoulder-straps. Officers are equipped with special full dress uniforms, evening dress and mess dress. The special full dress is only worn on important ceremonial occasions. Enlisted men have three classes of uniform; dress, undress and working dress of either white or blue. See also COSTUME, EPAULET.

Unigenitus, ū-nĭ-jĕn'ĭ-tŭs, the bull (1713) of Clement XI. by which 101 theological propositions of a Jansenistic tenor contained in the writings of Pasquier Quesnel are condemned as heretical, scandalous, impious, etc.: see QUESNEL; JANSENISM. The title of the bull is derived from its opening words *Unigenitus Dei Filius.* Among the doctrines alleged to be contained in Quesnel's writings ('Moral Reflexions' on the Gospels and the whole New

Testament) is this, that all love except the supernatural love of God is evil; that without this supernatural love there can be no true hope, observance of the law or religion; that every prayer made by a sinner is itself sinful; and that the Church is made up of the elect alone. While Louis XIV. lived he compelled obedience to the bull; but after his death, 1717, and the succession of his great-grandson, Louis XV. under a regency, those ecclesiastics who were opposed to the Roman decisions, among them Noailles, archbishop of Paris, and four other bishops, made appeal to a future council of the Church against the pope. Another appeal was made "from the pope ill informed to the pope better informed"; but the popes who succeeded Clement XI. down to 1730, namely, Innocent XIII., Benedict XIII. and Clement XII., would not entertain the appeal; the assembly of the French clergy, in 1723, petitioned the king to uphold the Unigenitus with all the power of the state; in 1727 one of the appellants, Soanen, bishop of Séez, was condemned by a provincial church council, and was banished by the government; even Noailles in 1728 went over to the side of the Ultramontanes, and in 1730 the Sorbonne formally accepted the bull; the same year the parliament of Paris was compelled to register it.

Unimak, oo-nĭ-măk', an island of Alaska, the largest of the Aleutian Islands, about 75 miles long and 25 miles wide. A lagoon called Isanotski, or False Pass, separates the island from the mainland of the Peninsula of Alaska. Like the adjacent islands, it is volcanic, Shishaldin, an active volcano, is about 9,000 feet high. Sulphur abounds on the slopes and base, in crevices, of Shishaldin and near Progrumnoi volcano (5,523 feet high), in the western part of the island. The island is rocky and almost destitute of trees. The villages are few and small.

Union, ū'nyŏn, Maine, town in Knox County; on the Georges Valley Railroad, a short line which extends from Warren (q.v.) to Union. The town contains the villages of Union, South Union, North Union, and East Union. It was settled in 1744 and was first called Taylor Town. In 1786 it was organized as the Plantation of Sterlington, but the same year it was incorporated and took the name Union. In 1811 a part of the town was set off and called the town of Washington. The chief manufacturing establishments are mowing machine works, machine shops, carriage and furniture factories, and organ works. Stoves are made here and considerable attention given to farm and dairy products. Pop. (1890) 1,436; (1900) 1,248.

Union, La, lä oo-nē-ōn', Philippines, a province of the island of Luzon, in the southwestern part of northern Luzon, bordering on the China Sea; bounded on the north by Ilocos Sur, on the east by Lepanto and Benguet, and on the south by Pangasinán; length, north and south, 51 miles; greatest width, 31 miles in the north, narrowing to 10 miles in the south; area, 867 square miles. The province is mountainous in the east, the western mountain sides sloping abruptly to the coast plains. There are numerous small rivers. The soil is well cultivated; tobacco, rice, corn, cotton, sugar, and chocolate are the principal products; large quantities of sibucao, a valuable dye plant, grow on the mountains. Live-stock raising is one of the principal industries of the province; carabaos and cattle, horses, and hogs are raised. The west coast road of Luzon traverses this province; this is paralleled by a telegraph line and also the proposed route for a continuation of the Manila & Dagupan Railroad; there are no roads, however, which extend any distance into the interior. Civil government was established in August 1901; and at the close of that year the provincial governor reported the province in a peaceful and prosperous condition. Pop. (1901) 110,464.

Union, La, Salvador, a seaport and capital of the department of the same, at the base of the Pinos volcano, rising from the west shore of Union Bay, a landlocked inlet of the Gulf of Fonseca. An active domestic and coasting trade is carried on. Pop. 4,000.

Union, Legislative, in British history, the incorporation of the kingdoms of Scotland by the Act of Union in 1707, and the union of the kingdom of Ireland with that of Great Britain in 1801. In the case of the union of Scotland with England to form the United Kingdom of Great Britain, it was provided in the Act of Union that there should be one parliament, in which the Scotch peers would be represented by 16 of their number to be elected for each parliament, and that 45 Scotch members should sit in the House of Commons. The Episcopal Church was to be the State Church for England, the Presbyterian for Scotland. Ireland was till 1801 a kingdom distinct from that of England and Great Britain, but in that year was united with Great Britain to constitute the United Kingdom of Great Britain and Ireland. Ireland's representation in the parliament of the United Kingdom was to be four lords spiritual (bishops) and 28 lords temporal in the House of Peers, and 120 members of the House of Commons. The Episcopal Church in Ireland and the Episcopal Church of England were united in one Protestant Episcopal Church.

Union Christian College, located at Merom, Ind. It was chartered in 1859 under the auspices of the Christian Church, and opened to students in 1860; the government of the college is vested in a board of 15 trustees elected by the stockholders from nominations made by the Church conferences of Illinois, Indiana, and Ohio. The college has, in addition to the regular collegiate departments of instruction, a Biblical Department, a Normal Department, a Department of Music, a Preparatory Department, and special courses in elocution and physical culture. There are two collegiate courses, the classical and scientific leading to the degrees of A.B. and B.S. respectively; a limited number of electives are offered in each course; and a thesis is required for the obtaining of a degree. The degrees of A.M. and M.S. are conferred for graduate work. The Biblical Department and the Normal Department both offer three years' courses. The college is open to men and women on equal terms; a separate dormitory is provided for young women. The students maintain two literary societies. In 1901 an offer of $30,000 for the endowment was received from F. A. Palmer of New York, on condition that the college raise $20,000. The condition was met by 1902, and thus $50,000 added to the

endowment fund. The students in 1904 numbered 189, and the faculty 10.

Union City, Ind., city, Randolph County; on the Pittsburg, C., C. & St. L. and the Cleveland, C., C. & St. L. R.R.'s; about 80 miles northeast of Indianapolis, and 32 miles east of Muncie. It is near the Ohio boundary. Union City is in an agricultural and stock-raising region; and the forests contain valuable hard woods, as ash, oak, hickory, walnut, and chestnut. The chief manufacturing establishments are flour mills, creameries, furniture factories, and machine shops. There are a high school, public and parish schools, and a library. The two state banks have a combined capital of $175,000. Pop. (1890) 2,681; (1900) 2,716.

Union City, Mich., village in Branch County; on the Saint Joseph River, and on the Michigan Central railroad; about 55 miles southwest of Lansing and 28 miles southeast of Kalamazoo. It is in a fertile agricultural region. The chief manufacturing establishments are a flour mill, creameries, a machine shop, and lumber mills. It ships a considerable amount of farm and dairy products, and fruit. The two national banks have a combined capital of $100,000. Pop. (1890) 1,156; (1900) 1,514.

Union City, Pa., borough in Erie County; on the Pennsylvania, the Western N. Y. & P., and the Erie R.R.'s; about 25 miles southeast of Erie. It is in an agricultural and oil region. The chief industrial establishments are flour mills, barrel factories, wagon and carriage works, furniture factories, oil-refinery, a tannery, and a pump factory. Cabinet ware and dairy products are among the shipments to outside markets. The educational institutions are a high school, public and parish elementary schools, a business college, and a library. There is one national bank, established in 1898, with a paid up capital of $50,000 and deposits amounting to $292,110. Pop. (1890) 2,261; (1900) 3,104.

Union City, Tenn., town, county-seat of Obion County; on the Nashville, C. & St. L. and the Mobile & O. R.R.'s; about six miles from the Kentucky border and 110 miles northeast of Memphis. It is in an agricultural and stock-raising region and nearby are extensive timber lands. The chief manufacturing establishments are lumber mills, ice factories, canneries, furniture works, cotton mills, spoke factories, and machine shops. The principal products shipped to other markets are farm and dairy products, fruit, cotton, and lumber products. In 1900 (government census) there were 35 manufacturing establishments, the value of whose average annual products was $558,470. The educational institutions are Union City High School and Training School, five public elementary schools, four for white and one for colored pupils, and a school library. The two banks have a combined capital of $100,000, and deposits, $175,000. Pop. (1890) 3,441; (1900) 3,407.

Union College, located at College View, a suburb of Lincoln, Neb. It is a part of the school system of the Seventh-day Adventists; the site was chosen in 1890, and the college opened to students in 1891. It is avowedly denominational and observes the Sabbath on the seventh day (Saturday). It is open to both men and women. It offers two regular college courses leading to degrees, the literary and scientific, and confers the degree of A.B. and B.S. A limited amount of elective work in advanced courses is allowed in the senior year. There is also an academic course of four years, and a number of special courses, including the ministerial course (three years), the advanced normal course (three years), the elementary normal course, preparatory medical course, preparatory nurses' course, commercial course, phonography course, and a German Biblical and a Scandinavian course, the two last mentioned being especially designed to train missionary workers among Germans and Scandinavians. Instruction is also given in music and art. In 1902 it was decided that manual training should be required of every student. Instruction and practice work are given in printing, broom-making, carpentering, blacksmithing, metal working, electrical work, tailoring, sewing, and cooking. 'The Central Advance' (a denominational paper), a German and a Scandinavian paper are printed at the college shop. The campus consists of 22 acres on elevated ground; the chief buildings are the main building, and the dormitories or "homes." The library in 1903 contained over 2,000 volumes; the students in all courses numbered 450.

Union College, located at Schenectady, N. Y. See UNION UNIVERSITY.

Union Flag, or **Union Jack,** the national flag of Great Britain and Ireland, is a composite of the prominent features of the flags of England, Scotland, and Ireland. The first union flag was made upon the accession of James I., and from the fact that that sovereign signed himself "Jacques" the flag has been improperly nicknamed the Union Jack (a "jack" properly being a flag flown upon the jack-staff of a ship). The first national flag in 1606 combined the English banner of St. George (argent, a cross gules) with the Scottish banner of St. Andrew (azure, a saltire argent). In 1707 the flag was revised, becoming in heraldic terms azure, a saltire argent surmounted by a cross gules fimbriated of the second. When Ireland was united with the kingdom of Great Britain the flag was again altered, the red cross of St. Patrick being introduced, and forming the present Union Jack. In heraldic terms it is: azure, the crosses saltires of St. Andrew and St. Patrick quarterly per saltire counterchanged argent and gules, the latter fimbriated of the second, surmounted by the cross of Saint George of the third fimbriated as a saltire. This was first hoisted on the Tower of London 1 Jan. 1801. The flag is the national flag for use on shore and for land forces; it is used at sea only on a ship bearing the English sovereign, when it is hoisted at the main mast, and at the main mast of the flag-ship of a fleet commanded by an admiral. When this flag design occupies the upper corner next the staff of a red, white or blue field the flag so formed is called the red, white, or blue ensign and is the flag for use on shipboard. Merchantmen carry the red ensign, and all British war vessels carry the white ensign divided into four quarters by the cross of Saint George. The British flag with a white star in the centre surmounted by a crown is the flag of the governor-general of India.

In the United States the term "Union Jack"

is applied to the blue flag with white five-pointed stars (one for each State in the Union), used in the navy. The flag is usually displayed when the vessel is in port.

Union Label, a method adopted in the United States by trade unions for the peaceful solution of the boycott question. The union label originated in 1896 with the cigarmakers of San Francisco in their conflict with Chinese labor. Since then its application has spread till all trades-unionism looks to it as one of the most successful means of waging the struggle with combined capital. By agreement with the manufacturers the labels, copyrighted by the unions, are attached to the various products of factory and mill, each box of cigars, for instance, each newspaper, each garment, and so on. A few unions, notably the famous "Big Six" Typographical Union of New York, with nearly 6,000 members, have imposed a fine for purchasing any but labeled goods, provided they can be had.

While many unions have their own copyrighted labels, a large number employ the common label of the American Federation. Many States have passed laws imposing penalties upon counterfeiters of labels, and upon users of counterfeit labels. See AMERICAN LABOR; LABOR; UNIONISM; etc.

Union League of America, The, began in 1862 in order to check the spread of disaffection to the United States government and to "make loyalty effective." The movement was spontaneous; the members of the United States Sanitary Commission began the organization in 1862, in Ohio, Philadelphia, and New York. Leagues were formed all over the North before the end of 1863. The members were pledged to repudiate any political belief that conflicted with unconditional loyalty to the Union. Several similar orders were absorbed by the Union League. The organization distributed more than 5,000,000 political pamphlets; recruited negro regiments; sent teachers to instruct the negroes; and demanded negro suffrage in 1865. The league was gradually extended into the South among the "Unionists," and during 1865–6 had a strong membership of whites in the mountain districts of that section. In 1867 negroes were admitted to the order in the South and at once nearly all of the whites deserted. From 1867 to 1876 the league and its offshoots formed the "machine" of the Radical party in the South. It controlled the negro vote absolutely and organized it well; it made all nominations for office, and severely disciplined those who disobeyed orders. A constitution and ritual were adopted for use in the South. There was a weird initiation ceremony to impress the negroes. The members swore to vote for no one except members of their own order. An ex-Confederate could not join unless he would acknowledge that his course during the war had been treason, and under no circumstances was he eligible to office in the order or to become a candidate for political office. The administration of the league was in the hands of the so-called carpet-baggers or political adventurers from the North. The local assemblies were called Councils; these together formed the Union League of America, with headquarters in each Southern State and general headquarters in New York. In the councils the negroes were drilled in the faith of the Republican party, a catechism being prepared for that purpose. There was complaint that the league was a cause of disorder and violence among the blacks on account of its incendiary teachings. At one time it was said that the membership reached 500,000 in the South. In the North after 1865 the order gradually died out, the surviving leagues becoming social clubs. As an institution of Reconstruction the Union League was most important. The rigid organization and the strict control imposed by it upon the blacks, made it possible for them to vote as a race and vote the Republican ticket. Without the admirable discipline of the order, the few leaders of the Radical party in the South would have been unable to prevent the Conservative or Democratic party from controlling the votes of the negroes, thus preventing the objects of the Reconstruction.

Consult: Bellows, 'History of the Union League Club of New York' (1876); 'Chronicle of the Philadelphia Union League' (1901); 'Gulf States Historical Magazine' (September 1903); 'Ku-Klux Report,' 13 vols. (1872); Herbert, 'The Solid South' (1890); Lester and Wilson, 'Ku-Klux Klan' (1884); West Virginia Documents relating to Reconstruction No. 3.

WALTER L. FLEMING,
West Virginia University.

Union League Club, The, a social and political club organized in 1860, in New York, by members of the local Republican party. It was incorporated in 1865, its avowed object being "to promote, encourage, and sustain by all proper means, absolute and unqualified loyalty to the government of the United States; to discountenance and rebuke, by moral and social influences, all disloyalty to said government and every attempt against the integrity of the nation"; and also to establish a library and art gallery for the collection of literature and works of art, and military trophies relating to the war. The club had a membership of about 2,000.

Union Pacific Railroad Company. The Union Pacific Railroad or "Overland Route," which was organized 1 July 1897, under an Act of the Legislature of Utah approved 22 Jan. 1897, "to carry out the plans of reorganization of the Union Pacific Railway Company," and now includes the Union Pacific Railroad, the Oregon R. R. & Navigation Company, the Oregon Short Line, and the Leavenworth, Kansas & Western Railroad, operates in Kansas, Nebraska, Iowa, Colorado, Wyoming, Utah, and Missouri. The system stretches westward from Omaha and Kansas City to Ogden, Utah, and also by its controlled lines, runs to and through the States of Oregon and Washington.

Mileage.— The total mileage, main track, is 5,588; second track, 105; sidings, 1,562; water lines, 258. The length of the Oregon Short Line is 1,301 miles; Leavenworth, Kansas & Western Railroad, 3,128 miles. The length of railroad lines of the Oregon R. R. & Navigation Company is 1,081 miles; water lines, 1,035 miles. The Oregon Short Line branches in Montana extend 56 miles; Idaho, 86 miles; Utah, 100 miles. The Union Pacific also own 8 small lines in Idaho and Utah, aggregating 280 miles.

Transportation and Equipment.— The aver-

age number of passengers carried one mile on this system, per year, is 450,000,000; tons of commercial freight carried, 10,000,000. The equipment in locomotives exceeds 800; passenger cars, 600; freight cars, 21,000.

Service.— The Union Pacific System service embraces several important features. One is the maintenance of "Colonist" one-way rates to the Pacific coast and principal western points every day from February to April, and from September to October. These special rates offer strong inducements for intending settlers to travel from Kansas City and other starting points, including Denver and Cheyenne; Chicago, Bloomington, and Peoria, Illinois; Saint Louis, Missouri; Saint Paul and Minneapolis, Minnesota; and Memphis, Tennessee, to points in California, Utah, Montana, Washington, and Oregon.

The special daily service, with full equipment of observation cars, drawing room and private compartment sleeping cars, dining cars and electric lights, includes the "Overland Limited" and "The Los Angeles Limited." The "Fast Mail," the "Colorado Special," the "China and Japan Fast Mail," the "California and Oregon Express," the "Chicago Special," and the "Portland-Chicago Special" are also well equipped.

Earnings and Expenses.— The total earnings of the road and its connections, 1905, amounted to $59,325,000; operating expenses, $32,000,000; net earnings $27,462,000.

Stock and Stockholders.— There are 14,256 stockholders in the Union Pacific Railroad Company. The common stock outstanding is valued at $108,772,000; preferred stock, $100,000,000. The bonded indebtedness of the company is $187,257,000. The rate per cent paid, last dividend (1 Oct. 1905) was: common, 2½ per cent; preferred, 2 per cent. The highest common stock quotations, 1904, were: highest, 117; lowest, 71; preferred, 1904, highest, 98; lowest, 86½. The highest common stock quotations, 1905, were 138¾; lowest, 113; highest preferred stock quotations, 1905, were: highest, 101⅝; lowest, 95½.

Water Service.— The water service covers a large area and embraces several steamship lines, including routes between San Francisco and Portland, on the Columbia River, to the East to Panama, and in other directions.

Tourist Service.— Tourist cars run to and from California and Oregon daily, via Omaha, supplying all facilities required for this special service.

History of the Road.— The Union Pacific Railroad Company was formed "for the purpose of acquiring, constructing, and owning railroads in the State of Utah, and elsewhere, with specific authority to acquire the railroads, properties, franchises, and land grants formerly belonging to the Union Pacific Railway Company." That corporation owned four divisions of railroad, with a total length of lines of 8,172 miles. In 1893, receivers were appointed for all lines except those owned jointly with other companies. Afterwards, separate receivers were appointed for some of the controlled roads.

When the Union Pacific Railway Company was first placed in the hands of receivers, the bonds outstanding aggregated $78,470,000. In addition to this amount, the government subsidy bonds amounted to $33,540,000. On this latter amount, the unpaid interest was $18,194,000. At that time the share capital of the company aggregated $60,869,000. A short time after the receivers had taken possession of the property, legislation to guarantee a Federal government lien at 3 per cent was proposed in Congress. The security holders at the same time put forward a re-organization method. Both plans were defeated.

In 1897 the main line, from Council Bluffs to a point five miles west of Ogden, Utah, a distance of 1,048 miles, together with 70 per cent of the equipment, was sold under foreclosure and purchased by the re-organization committee, which later, borrowed $44,000,000 from a syndicate. Following this event many extensions were made. In 1899, control was acquired of the Oregon Short Line Railroad. This purchase was followed by that of the Oregon R. R. & Navigation Company property. In 1901, by purchase of a controlling interest, possession was gained of the Southern Pacific Railroad Company and, three months later, control of the Northern Pacific Railroad Company was acquired.

Recent Progress.— During 1905, the company advanced over $13,000,000 for new lines, steamship, and rolling stock. This included 341 miles of additional completed main track, 35 locomotives, and two steamships of 27,000 tons each. The increase in gross receipts, 1905, over 1904, was $835,000. The present plant consists of 835 locomotives, 556 passenger cars, 22,406 freight cars with a carrying capacity of 661,000 tons.

Union Springs, Ala., town, county-seat of Bullock County; on the Central railroad of Georgia; about 40 miles southeast of Montgomery and 175 miles northeast of Mobile. It is in an agricultural and fruit region. The chief manufacturing establishments are cotton gins, cottonseed-oil mills, cotton mills, spoke and handle factories, grist mills, and a machine shop. The educational institutions are a high school, founded in 1899, public graded schools, and several private schools. The two banks have a combined capital of $122,000, and deposits, $310,000. Pop. (1905) 3,000.

Union Theological Seminary, located in New York. It was founded in 1836 under the auspices of the Presbyterian Church; the directors and professors of the seminary give their assent to the Westminster standards of this Church, but students of all denominations are freely admitted. The seminary offers the following courses: (1) A three-years' course leading to a diploma requiring the study of Greek and Hebrew; (2) a three years' course leading to the degree of B.D., requiring more hours' work and a higher standing than the diploma course, special work in some department chosen by the student and including a thesis; (3) a four years' course requiring one year's graduate work and a thesis; (4) special and partial courses. For admission to the degree courses college graduation is required; for the diploma course college graduation or examination in Latin, Greek, philosophy, English, and history. Part of the work in the regular courses is elective, and some electives are provided for at Columbia and New York universi-

ties. The curriculum of the seminary includes courses in Old and New Testament philology and exegesis, biblical, systematic, and practical theology (including study of missions), apologetics, Christian ethics, church history and history of religion, voice culture and sacred music. Training in actual Christian work is provided in churches and chapels, public institutions, and settlement work; the Union Settlement is closely related, though not officially affiliated with the university. Seminary extension courses for lay workers were established in 1901. There are a number of undergraduate scholarships, four graduate scholarships, and two fellowships. The seminary buildings contain a chapel, lecture-rooms, library, museum, reading room, gymnasium, social room, and dormitory rooms. The library in 1904 contained 79,940 volumes, including special collections in American and English history. The students in 1904 numbered 119, including the 2 fellows and 41 graduates.

Union University. Union College, unlike the other older colleges in America, came into existence in response to a popular demand, which was essentially a citizens' movement, and expressed the growing national feeling. For this reason it did not take the name of any individual, and was from the beginning independent of denominational control. The first petition, signed by 850 citizens of Albany, Tryon, and Charlotte counties, was presented to the legislature of New York in 1779, or while the Revolutionary War was still in progress. It was not, however, until 1795, and after repeated appeals to the legislature, that a college charter was granted, although in 1785 an academy was organized which became the practical foundation of the college. The first president was the Rev. John Blair Smith, a graduate of Princeton. He was succeeded after four years by the Rev. Jonathan Edwards, the Younger, who died in 1801. The next president was the Rev. Jonathan Maxcy, a graduate of Brown and a Baptist, who resigned because of ill-health in 1804, when the Rev. Eliphalet Nott, also an alumnus of Brown, but a Presbyterian, was elected to the presidency. With his election the college began a new and aggressive life. Dr. Nott was a man of commanding presence and inspiring personality, fertile in ideas, and tireless in energy. Under his vigorous administration the college grew rapidly in numbers and in reputation, until it became one of the most prominent institutions in the country. Dr. Nott may be called the pioneer in modern educational progress. He was the first to break away from Old World traditions, and introduce new courses of study. As early as 1809 he instituted a course in modern languages, and in 1835 he established a scientific course running parallel for three years with the classical course. In 1845 he added a course in civil engineering, anticipating the demand for technical training which almost every other institution has since recognized. In still other ways Union College early gained distinction. It gave larger liberty to student life, and for necessary discipline depended more upon moral suasion than upon the enforcement of arbitrary penalties. It originated the college fraternity system, the oldest of these Greek letter societies, Kappa Alpha, Sigma Phi, and Delta Phi, having been founded at Union in 1825, 1827, and 1828, respectively. These were followed by Psi Upsilon in 1833, Chi Psi in 1841, and Theta Delta Chi in 1847. Dr. Nott's presidency covered a period of 62 years, from 1804 to 1866, when he died at the advanced age of 93 years. He was succeeded by the Rev. Laurens P. Hickok, who had served as vice-president during the latter part of Dr. Nott's life. In 1868 Dr. Hickok resigned, and in 1869 the Rev. Charles A. Aiken was elected to succeed him. Dr. Aiken held the office for two years, and was followed by the Rev. Eliphalet Nott Potter, a grandson of Dr. Nott. Under Dr. Potter the college was greatly strengthened, and regained much of its earlier prestige. He resigned in 1884, when for four years the college was without an official head, the Hon. Judson S. Landon acting as provisional president. In 1888 Harrison E. Webster became president, but because of ill-health resigned in 1894, and was succeeded by the present president, the Rev. Andrew V. V. Raymond.

Union College is noted for the large number of its graduates who have become prominent in political life and as men of affairs. Before 1860, it was the most distinctively national of all our educational institutions, drawing its students from every part of the country, especially from the South. Because of this it suffered more than did any other Northern college during the Civil War. It has always been thoroughly democratic in spirit, and has aimed to give its students a practical education. In recent years, while not abandoning its historic position as a classical and literary institution, it has taken advantage of the exceptional opportunities offered by its location in the city of Schenectady, the recognized centre of scientific interests, and has developed, with the co-operation of the General Electric Company, strong civil, sanitary and electrical engineering courses. With its inspiring traditions, its present sound financial condition, and its increasing patronage, this old college has much to expect of the future.

In 1873 Union University was organized by legislative act, and included the academic and engineering departments in Schenectady, and the law school, medical college, and Dudley Observatory in Albany. To these several departments was afterward added a school of pharmacy, founded in Albany in 1881. The academic department offers three courses, leading to the degrees of A.B., B.Ph., and B.S.: the work of the last two years is largely elective; in addition the work of the engineering department leads to the degree of bachelor of engineering. The course at the medical school is four years, and the courses at the law school and school of pharmacy two years each. The observatory possesses a large equatorial telescope, a meridian circle, and full scientific equipment.

A. V. V. Raymond, D.D.,
President Union University.

Union'idæ, a family of bivalved mollusks, the fresh-water mussels (q.v.).

Unionism, or Labor Union, a general name for organized labor. In the United States one person in every 40 of population, or something over 2,000,000 individuals are affiliated with labor organizations. These associations are the natural result of the extension of the factory system and the outcome of modern industrialism. In Great Britain trade-unionism

is of older growth than in the United States, but since 1890, this country has reached a definite plane of comparison. The accompanying diagram prepared by William Z. Ripley, professor of economics in Harvard University, will show the growth of trade-union membership in various countries since 1891. One of the most interesting features of this diagram is the position occupied by Great Britain and Ireland. Until 1900, despite their relatively small size, these countries stood against all the other great nations of the world in a class by themselves as respects the forces of organized labor. Until 1901 they had more trade-unionists than all the rest of the world put together. France and Germany betrayed relatively little evidence of this effect of modern industrialism. The upward trend in the number of unionists

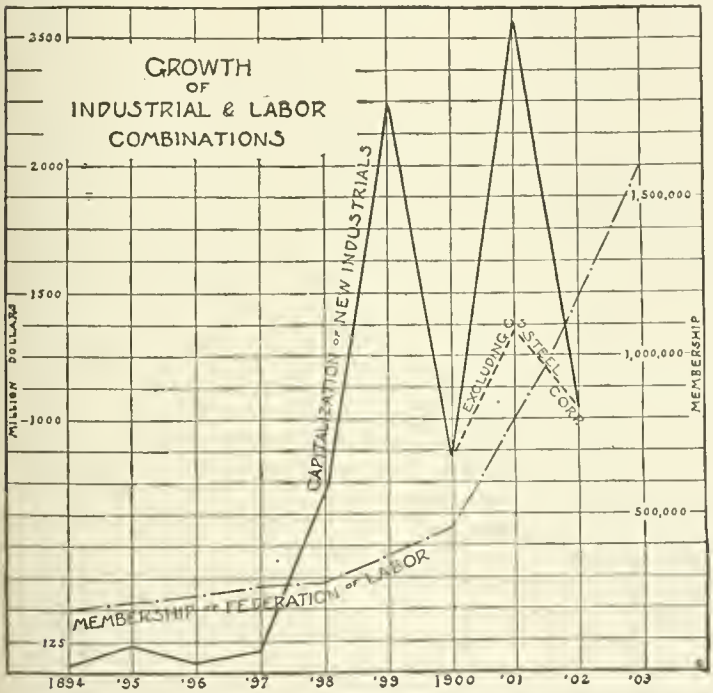


Chart showing the comparative growth of trades-union membership and capitalization of industrial enterprises. (Note that while the organization of new enterprise line has varied greatly from year to year, the labor union line shows a steady and rapid increase.)

in both these countries seems, however, to be going on at about the same rate — a rate not different from the annual growth in Great Britain.

In the United States.— While English unions have increased, in nine years, from 1,500,000 to 1,900,000, those of the United States have grown from 900,000 to 2,000,000. The causes for this growth have been, in the main, prosperity, the trust or combination idea, the coal strikes and the labor movement's natural growth. In 1895, the American Federation of Labor (q.v.) — the most powerful representative body in the United States, comprising at present more than three quarters of the forces of organized labor — had perhaps 200,000 members. President Gompers estimates that the organization in 11 months to October 1902 had added 300,000 to its membership, a figure greater than its total enrollment in 1898 and nearly equal to its membership in 1899. In 1897 it was conservatively estimated that the membership of the American Federation of Labor was 950,000, and that the total for the United States, including the Railway Brotherhoods, the Knights of Labor and other independent organizations, was 1,400,000. The New York Bureau of Labor, about the same time, figured out a total of 1,600,000. The present membership, in 1903, of the American Federation of Labor, being 1,600,000, and assuming that the independent organizations have at least held their own since 1900, we have a total for the United States of about 2,000,000, as against 1,900,000 for Great Britain and Ireland. In New York State alone in 1903 there were 2,365 unions in existence, as against 1,156 in 1899 and 976 in 1897. Their aggregate membership had increased during this time from 151,000 in 1897 to 357,000 in 1903. The United Brotherhood of Carpenters, as a national body, claims to have added 30,000 new members in 1901 and 35,000 in 1902.

The growth of trade-unionism in America is due largely to the trust and combination movements of capital, together with the large strikes in the coal mining regions. As showing the chronological sequence in the two phenomena of combination in labor and capital respectively, the accompanying diagram is not without interest. It is based upon a careful summary annually compiled by the New York *Journal of Commerce*.

The Coal Strikes.— The effect of the coal mining strikes in Pennsylvania and elsewhere upon labor organizations is shown by the following figures giving the growth of paid-up membership of the United Mine Workers of America. These are the official statistics of averages at the close of each year as furnished:

Years	Members	Years	Members
1897.....	9,731	1901.....	198,024
1898.....	32,902	1902.....	175,367
1899.....	61,887	1903.....	268,000
1900.....	115,521		

There are in addition some 57,000 members not paying the membership tax, bringing the total up to 325,000. In the official figures for Great Britain there are only about 500,000 members of trades-unions in mining and quarrying. That the American miners have trebled their numbers since 1900, and have added about 100,000 since 1902, is to be certainly ascribed to the great strikes in the coal regions. John Mitchell of the United Mine Workers maintains for the strike when he says: "From first to last, from beginning to end, always and every-

where, trade unionism stands unalterably opposed to the individual contract. Strikes are necessary weapons, and the direct boycott — that is, the boycott against the principals in a labor dispute — is justifiable."

The Building Trades.— Great construction companies, wholesale employers of labor in the building trade, have been at war since 1899 more or less incessantly with the trade-unions. Strikes, lockouts and boycotts have been common in all the larger cities. Since 1901 the building industry has involved in the United States an annual outlay of something like $400,000,000 and employs more than 1,000,000 men. The year 1904 promised, at the outset, to surpass all others in money and men employed, when building in every part of the country was interrupted by an epidemic of strikes. Chicago, San Francisco, and Saint Louis alone were excepted. Saint Louis was building its World's Fair and could not afford to risk delay. Chicago and San Francisco evolved organs of sufficient power to insure temporary peace — in Chicago the Contractors' Council, in San Francisco the central body of the unions. All the other cities was more or less affected. At one time, when 150,000 men were calculated to be out in New York and Brooklyn, 50,000 were on strike in Philadelphia and 20,000 in Baltimore, while the Pittsburg district was on the verge of a complete lockout involving 40,000 more. The lesson of this epidemic of sympathetic strikes and lockouts is, that the building trades must be considered as a single industry, and that their labor problem must be treated as a single problem, not as a problem of 30 different trades. Both capital and labor must be organized and a constitution must be provided for the trade. In this connection the union "scale" of wages in the building trades for 1902, compiled on a basis of eight hours work a day, may be studied with more or less interest (see top of next page).

Demands of Labor.— The demands of the American Federation of Labor made in resolutions at its annual convention for 1903, will show what is sought by the American trade-unionist. These demands were as follows:

1. Compulsory education.
2. The repeal of all conspiracy and penal laws affecting seamen and other workmen, incorporated in the Federal and State laws of the United States.
3. A legal work day of not more than eight hours.
4. Sanitary inspection of workshops, mines and homes.
5. Liability of employers for injury to health, body and life.
6. The abolition of the contract system in all public works.
7. The abolition of the sweating system.
8. The municipal ownership of street cars, waterworks and gas and electric plants for the distribution of heat, light and power.
9. The nationalization of telegraphs, telephones, railways and mines.
10. The abolition of the monopoly system of land holding and the substitution therefor of the title of occupancy only.
11. Direct legislation and the principle of referendum in all legislation.
12. The abolition of the monopoly privilege of issuing money and substituting therefor a system of direct issuance to and by the people.

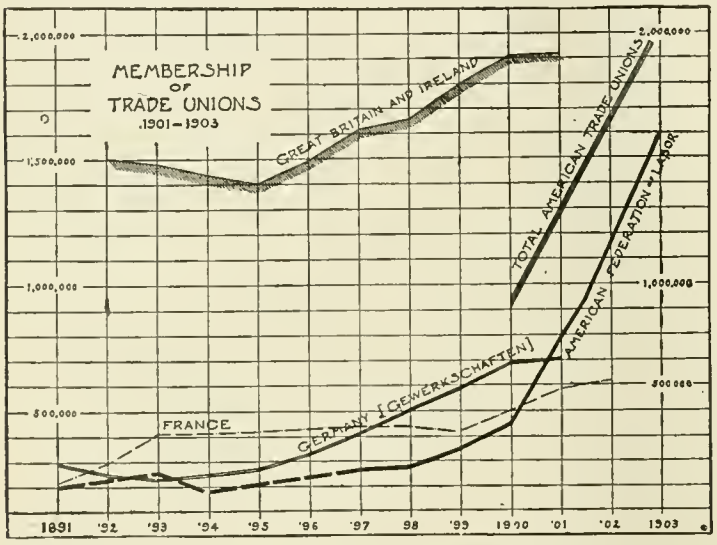


Chart showing the growth of trades-union membership in different countries since 1891. (Note that where it took the English unions nine years to increase their membership from 1,500,000 to 1,900,000, the American unions in three years grew from 900,000 to 2,000,000.)

The trade-unions of the United States are usually willing to resort to conciliation in the adjustment of differences as they arise, such conciliation to consist of committees representing each side, and with equal power. They are usually in favor of arbitration when all means of conciliation have been exhausted, but they are opposed to compulsory arbitration, so called, and usually to compulsory investigation of the conditions attending a controversy. They do not object to, although they have little faith in, State boards of arbitration or other perfunctory legislative methods of adjusting difficulties. They are in favor of a strict legislation relative to blacklisting. They claim that the blacklist is a rank injustice, and that wherever practised there is a degradation of the man blacklisted, and an annoying and irritating influence upon those who are not; that it is a menace to the well-being of labor everywhere. On the other hand, they do not hesitate to use the boycott in enforcing their demands, on the ground that it is a legitimate war measure against men who are considered as strike-breakers, and thus traitors to the cause of labor. They insist that during periods of labor strikes or other controversies no man or body of men should be enjoined to prevent the doing of something which, if done, would be punishable under the criminal code; that they should not be debarred by injunction from picketing or patrolling, so-called, or from representing to non-union men that they had better not enter the service of the employer involved in a strike. They recognize their duty to avoid physical violence or intimidation, but claim that if they indulge in this, only those men engaged should be dealt with under the law. They insist that if they violate the law, and are thus amenable

THE UNION "SCALES" IN THE BUILDING TRADES, 1902.

	Average of Eight Trades	Masons and Bricklayers	Structural Iron Setters	Plasterers	Plumbers	Steamfitters	Carpenters	Painters	Laborers & Hodcarriers
New York	$4.26	$5.20	$4.50	$5.00	$4.25	$4.00	$4.50	$4.00	$2.68
San Francisco	4.18	6.00	2.75	5.42	4.50	4.50	4.50	3.50	2.87
St. Louis	4.09	4.60	4.00	5.00	5.00	4.50	3.20	3.20	2.50
Denver	3.58	5.25	3.20	4.40	4.25	4.25	3.20	3.50	2.71
Pittsburg	3.53	4.80	3.80	4.50	4.00	4.00	3.50	3.20	2.04
Chicago	3.50	4.40	4.00	4.00	4.00	4.00	3.60	3.20	2.40
Washington	3.46	4.50	4.00	4.00	3.75	3.50	3.25	2.90	1.62
Minneapolis	3.45	4.40	3.20	4.50	4.00	4.00	2.50	2.80	1.68
Kansas City	3.41	4.50	2.90	4.00	4.00	4.00	2.90	2.80	2.09
Cleveland	3.35	4.00	4.60	4.00	3.50	2.90	2.80	2.80	2.12
St. Paul	3.20	3.90	3.90	4.50	4.00	2.90	2.70	2.67	1.75
Cincinnati	3.14	4.50	4.00	....	3.50	2.90	2.80	2.80	2.20
Philadelphia	3.11	4.00	....	3.60	3.20	2.90	2.80	2.90	2.21
Buffalo	3.10	4.60	3.60	4.00	2.90	3.25	2.65	2.90	1.48
Milwaukee	3.09	4.00	3.20	3.20	3.50	2.90	2.80	2.80	2.20
Providence	2.80	3.50	2.50	3.50	2.90	3.89	2.50	2.75	1.82
Detroit	2.75	3.50	2.50	4.00	2.76	2.75	2.40	2.25	1.60

to punishment under it, they should not be subject to fines and imprisonment for contempt of court under an injunction; and they are now claiming that all petitions for injunction should first be heard, either by a jury or otherwise, before they are subject to the process of contempt. They are not in favor of socialistic revolution; that under the present industrial system their affairs can be adjusted, their claims fairly met, and their condition made reasonably satisfactory. They are, as a rule, in favor of the extension of state control in certain directions, but they are not social democrats as distinguished from state socialists. They claim that the chief force which is extending state-socialist doctrines comes from employers, through trusts and combinations, and the aggregation of capital. They are, therefore, to some extent in favor of some regulation of fortunes and incomes, and the heavy taxation of incomes on some progressive principle. (See LABOR.) Consult Mitchell, 'Organized Labor' (1903).

U'niontown, Pa., borough, county-seat of Fayette County; on three branches of the Pennsylvania and one branch of the Baltimore & Ohio R.R.'s; about 70 miles south of Pittsburg, in the southwestern part of the State. It was settled in 1768 by Henry Beeson, and it was first called Beesontown. It was incorporated in 1796. Uniontown is in an agricultural region, but the county is noted for its extensive annual output of coke. In the vicinity are coal fields, deposits of iron ore, glass sand, and natural gas. The chief manufacturing establishments are two glass plants, two foundries, four planing mills, two flour mills, and machine shops, employing in all about 1,000 men. The coke plants near by employ about 5,000 men. There are 12 churches. The principal public buildings are the Uniontown Hospital, county courthouse, jail, County Home for the poor, and the schools and churches. The educational institutions are a high school, and public elementary schools. The four banks have a combined capital of $350,000, with deposits amounting to $3,693,770. Two trust companies have a combined capital of $300,000, and deposits $589,290. The government is vested in a mayor and a council of eight members, four of whom are elected each year. Pop. (1890) 6,359; (1900) 7,344.

O. J. STURGIS,
Editor 'News Standard.'

U'nionville, Mo., town, county-seat of Putnam County; on the Chicago, Burlington & Kansas City railroad; about 140 miles, in direct line, north by west of Jefferson City. It is in an agricultural and stock-raising region and in the vicinity are large coal mines. The industries are chiefly connected with farm products and mining. The educational institutions are the public graded schools, one private school, and a school library. The three banks have a combined capital of $115,000, and deposits amounting to $406,980. Pop. (1890) 1,118; (1900) 2,050.

Unit. See UNITS.

Unitarianism in the United States. Unitarianism as a religious faith was not transplanted from England to America simply with the coming of Joseph Priestly to settle in Pennsylvania. The tendency to liberal thought and the elevation of reason above tradition grew up especially in New England in the gradual revulsion in the mind of both laity and ministry from the Calvinistic teaching which generally prevailed in the 17th century. The benediction of Robinson upon the sailing of the Pilgrims, which prophesied that more light would break out of God's word, was soon forgotten among the earlier settlers and their religious teachers, in the desire to emphasize the liberty which they had achieved by fixing the limits of its invasion by discontented minds.

The early history of Congregationalists in Massachusetts and Connecticut is too well known to need elaboration here. The 18th century saw the rise of diverse opinion. Arminianism made its protest against Calvinism first. "Freedom of prophesying" declared itself in the establishment by Roger Williams of the Baptist societies in Rhode Island. The contention for the inner light drew forth the witness of the Society of Friends in Massachusetts and Rhode Island; and the difference of view maintained by Thomas Hooker in Connecticut was not the least sign of this desire to break the mold in which the early opinion was cast.

The middle of the 18th century found many men in the New England churches preaching a doctrine antagonistic to that which had been earlier maintained and had expressed itself dogmatically in the theology of Jonathan Edwards. The word Unitarian began to be used with respect to preachers of the Congregational order by those who found them inclined to dissent

from the more Calvinistic tradition. Many of the churches insisted upon the earliest covenants as a sufficient expression of religious purpose without a further imposition of religious opinion. Contests began to arise between the parish and the church as co-ordinated parts of the same organization. As early as 1672 at Salem, and in 1685 at Dedham, this collision was marked by the refusal upon the part of the parish to allow to the church the minister that it had selected. As early as 1699, the Brattle Street Church in Boston, although accepting the Westminster Confession of Faith, insisted upon the reading of the Bible without comment as part of the church service. Perhaps the first challenge in the name of rationalism was uttered by John Wise of Ipswich, who published his 'Vindication of the Government of the New England Churches' in 1717. He says that "It is a characteristic of man that an original liberty was enstamped upon his rational nature, and his liberty under the conduct of right reason, is equal with his trust. He that intrudes upon his liberty violates the law of nature."

The 18th century saw the growth of democracy among the Congregational churches and great diversity of opinion upon matters theological. In 1737 Edward Holyoke, upon being proposed as a candidate for the presidency of Harvard College, was opposed by the Calvinists, although he was finally elected to that office. President Quincy, speaking of this event and of the conditions in New England which made it possible, says: "In Boston and its vicinity and along the seaboard of Massachusetts, clergymen of great talent and religious zeal, openly avowed doctrines which were variously denounced by the Calvinistic party as Arminianism, Arianism, Pelagianism, Socinianism, and Deism. The most eminent of these clergymen were alumni of Harvard, active friends and advocates of the institution, and in habits of intimacy and professional intercourse with its government." It is recorded that "candidates for degrees in Harvard University in 1737 proposed to prove that the doctrine of the Trinity was not contained in the Old Testament, that creation did not exist from eternity, and that religion is not mysterious in its nature." In 1738, when it was proposed to examine a professor of mathematics as to his principles of religion, the proposition was rejected, though after a long debate.

This struggle going on in Massachusetts for a larger interpretation of religious liberty seems to have been the occasion for the adoption by Yale College for the first time, of the 'Assembly's Catechism and Confession of Faith.'

These things are mentioned to show that the planting of a Unitarian church at Northampton, Pa., by Joseph Priestly in 1794, and the formation of a church by him in Philadelphia in 1796, had been long preceded by the natural growth of liberalism with marked Unitarian tendencies.

In 1792 a Unitarian congregation was formed in Portland, Maine. Thomas Oxnard, who had been an Episcopalian, became its leader. Four years earlier, Mr. Oxnard, under the influence of Dr. Freeman, Priestly, and Lindsay, had written to a friend in England: "I cannot express to you the avidity with which Unitarian publications are sought after. Our friends here are clearly convinced that the Unitarian doctrine will soon become the prevailing opinion of this country. Three years ago I did not know a single Unitarian in this part of the country beside myself, and now, entirely from the various publications you have furnished (from England) a decent society might be collected in this and the neighboring towns." This declaration from New England may be compared with that of Thomas Jefferson in Virginia that "in a century there would be few young men who did not profess the Unitarian faith."

In the year 1792 a Unitarian congregation was gathered in Saco, Maine. Dr. Freeman, the minister of King's Chapel, reported in 1794, that Unitarianism was making considerable progress in the southern counties of Massachusetts; and in 1796 he states: "Unitarianism is on the increase in Massachusetts."

Dr. Belknap became the minister of the Federal Street Church in Boston in 1797, avowing the Unitarian faith. Considerable influence seems to have been exerted by the elder Hazlitt upon the opinions of those with whom he came in contact, and he is said to have assisted Dr. Freeman in 1784 in revising the Prayer-Book for the use of King's Chapel, of which Dr. Freeman was the minister. The King's Chapel service as still used in King's Chapel, Boston, is the result of this revision; this service, made from the English Church Service, preceded the Prayer-Book of the Protestant Episcopal Church in America by several years.

Perhaps the first actual collision occurring in an individual church which resulted in the establishment of a congregation avowedly Unitarian, occurred in 1800 in the Society at Plymouth. Chandler Robbins, minister of the Plymouth Society from 1760 to 1799, died in the last-named year. The parish divided upon the election of a new pastor, James Kendall being the candidate. For his election as pastor, 23 members of the church voted, and 15 dissented. But when the parish was called together, 253 voted for Mr. Kendall, and 15 were opposed. The settlement of Mr. Kendall was the settlement of an avowed Arminian. Whereupon 18 men and 35 women withdrew from the Plymouth Church, and two years later organized the society called the Church of the Pilgrimage.

In 1808 the Andover Theological School was founded to maintain the view which opposed the growing liberalism of Harvard College. Meantime Joseph Buckminster, William Ellery Channing, Francis Parkman, Samuel C. Thatcher, and Charles Lowell, settled over Boston churches, had made earnest protest against the Calvinistic doctrine in the interest of individual interpretation of religious conviction.

At the installation of Jared Sparks over the church in Baltimore in 1819, William Ellery Channing preached the sermon in which he set the five points of Unitarianism over against the five points of Calvinism; and by the earnestness of his presentation, the clearness of his logic, and the spirituality of his teaching, put the Calvinistic champions upon the defensive. In the same year, he preached in the city of New York to promote the organization of the First Congregational Society in that city, which still exists as the Church of All Souls, its organization being followed in 1826 by the creation of a second society, now known as the Church of the Messiah.

The effort to co-ordinate all these interests

to a common centre took form in 1820 in the creation of the Berry Street Conference, under Channing's leadership, and in 1825 by the organization of the American Unitarian Association. Meantime, on the 20th of April 1821, the first number of 'The Christian Register' was issued, as the organ of rational and spiritual religion, with such contributors in its earlier years as Joseph Story, Edward Everett, Dewey, Palfrey, Pierpont, Lowell, Noyes, and Bancroft. The purpose of this weekly publication, which is now in its eighty-third year of issue, is stated in the prospectus as follows: "To inculcate the principles of a rational faith; to promote the practice of genuine piety. To accomplish this purpose, it will aim to incite a spirit of free and independent religious inquiry, and to assist in ascertaining and bringing into use the true principles of interpreting the Scriptures."

The Unitarian position had been accepted by so large and influential a body of laymen in Massachusetts that the Orgnization Committee of the American Unitarian Association contains some of the most distinguished names of that State as early as 1825. There was no active propaganda, however, of views held by Unitarians. Dr. Channing, in answering the attack of Dr. Jedediah Morse, declared: "Accustomed as we are to see genuine piety in all classes of Christians; in Trinitarians and Unitarians, in Calvinists and Arminians, in Episcopalians, Methodists, Baptists, and Congregationalists; and delighting in its character wherever it appears, we are little anxious to bring men over to our peculiar opinions." This corresponds with the exhortation of Ralph Waldo Emerson at the second meeting of the Free Religious Association when he remarked "Let us leave controversy to communities more idle and more ignorant than ourselves."

It became inevitable, however, that there should arise disputes over the possession and control of the church properties of these divided congregations. The contention in the First Church in Dedham, Mass., was finally determined by legal proceedings. The decision of the court was as follows:

"When the majority of the members of a Congregational church separate from the majority of the parish, the members who remain, although a minority, constitute the church in such parish, and retain the rights and property belonging thereto."

A precedent was thus established, by means of which all cases might be disposed of which presented themselves between parishes and churches in the controversial times which followed.

The Unitarian movement in America has maintained the Congregational method of government, and has steadily refused to allow the encroachment of any ecclesiastical authority upon the rights of the individual congregation. There has been, however, a growing feeling in favor of organization as between the churches. This took form in 1865 in a convention of ministers and laymen held in New York under the leadership of Rev. Henry W. Bellows, minister of All Souls' Church, which resulted in the formation of what is known as the National Conference of Unitarian and Other Christian Churches, the purpose of which as stated by its constitution, is "to strengthen the churches and societies which should unite in it for more and better work for the kingdom of God; to recognize the fact that its constituency is Congregational in tradition and polity"; and declares that "nothing in its constitution shall be construed as an authoritative test"; and "cordially invites to its working fellowship any who while differing from it in detail, are in general sympathy with its spirit and its practical aims." It is a delegate body, consisting of the minister and two lay delegates from each church society, and representatives from the various local organizations, and is intended by conference to map out the movements which shall be commended to the churches and urged upon the various organizations which are the agents of the churches' mind.

Various other forms of denominational activity have conserved the interests of Unitarianism in America. The Unitarian Sunday School Society was organized in 1827, two years later than the American Unitarian Association. Its publications have received the highest praise from experts in religious education. The National Alliance of Unitarian and other Liberal Christian Women was organized in 1890, having for its object primarily, "to quicken the religious life of our Unitarian churches, to bring the women of the denomination into closer acquaintance, co-operation and fellowship." This organization has now 13,000 members. The Unitarian Temperance Society was organized in 1886, and the Young People's Religious Union in 1896.*

The Divinity School of Harvard University was established in 1817. The endowment was provided by Unitarians that "every encouragement be given to the serious, impartial and unbiased investigation of Christian truth." Its constitution provides that "no assent to the peculiarities of any denomination of Christian shall be required either of the instructors or students."

The Meadville Theological School was opened for students preparing for the ministry in 1844. It has maintained at Meadville, Pa., a rigorous training school of a high grade of scholarship for the ministry of religion, providing by the charter that "no doctrinal test shall ever be made a condition of enjoying any of the opportunities of instruction in the school." Tuition is without charge.

Various local conferences, clubs, and minor organizations have marked the growing activity of Unitarianism in the last 25 years of its work in America. The number of Unitarian churches in the United States is about 450.

Unitarianism has been defined as not a body of doctrine, but a way of thinking and a method of life. The determination to subordinate dogma to religious experience, and ecclesiastical rules to the fellowship of the spirit, necessarily involved the Unitarian churches in a controversy with those who believed that the religious life must be expressed with intellectual accuracy, and who held that tradition was the sign of orthodoxy. This period of controversy in which Theodore Parker's name stands as representative both by the vigor of his attack and the sturdiness of his resistance, gradually yielded to the consensus of feeling among the Unitarian churches that work for the kingdom of heaven among men was more important than the build-

ing up of the individual churches themselves. This has resulted in making Unitarianism less a missionary movement than a spiritual influence. It has claimed as its distinction that which others have claimed as its reproach, that it has "no body of divinity," but emphasizes that divinity which embodies itself anew with every divine inspiration, rather than the body of divinity, from which life often has departed.

Unitarians have no creed. There is a consensus of belief among them which asserts itself over all minor differences, and leads to a unity among the churches and in each church far more potent than that which has been achieved by the churches upon which authority is imposed. The National Conference of Unitarian and other Christian Churches states its basis of religious fellowship in the following words: "These churches accept the religion of Jesus, holding, in accordance with his teaching, that practical religion is summed up in love to God and love to man." This may be further emphasized by the statement attributed to James Freeman Clarke, for 48 years the minister of the Church of the Disciples in Boston, who expressed the Unitarian faith as "belief in the Fatherhood of God, the brotherhood of man, the leadership of Jesus, salvation by character, and the progress of mankind upward and onward forever." Perhaps its practical activities and mental attitude have been well expressed by the phrase initiated first by Dr. Edward Everett Hale, one of its most distinguished and trusted leaders, as "looking up and not down, forward and not backward, out and not in, and lending a hand." This motto which Dr. Hale describes in 'Ten Times One are Ten,' has been adopted by great bodies of young people, and to its initiative may be attributed the formation among many other denominations of the Epworth League, the King's Daughters, the Look Up Legions and several others, to unite, upon a purpose, rather upon an opinion, great bodies of young people for the religious life.

Nearly all local Unitarian churches have adopted a covenant which is the expression of their purpose and not the expression of theological opinion. Many of these covenants are the same as those used in the earliest colonial churches, notably that in Salem. Others formed during the last 25 years have adopted as a simple covenant this form: "In the love of the truth and in the spirit of Jesus Christ, we join for the worship of God and the service of man." These covenants are a basis of union and a statement of purpose in the individual church, and are not construed as a test of membership, in accordance with the fundamental rule that character, not opinion; integrity, not theological accuracy, is first to be considered.

The word "Unitarian," used first as an epithet, has been cheerfully adopted as perhaps the easiest way in which to announce the fundamental doctrine upon which all Unitarians agree — namely, the unity of God as distinct from any speculation as to the Trinity. The doctrine of the unity of God is held by all Unitarians to be true and necessary to integrity of thought and the higher inspiration of religion. With this fundamental doctrine is associated the declaration of the simple humanity of Jesus; the unfailing work of the Holy Spirit; the universality of revelation; the direct communion of the spirit of God with the spirit of man. In other words, the difference as to doctrinal position between Unitarian and other Christian churches appears not in what Unitarians believe, but in what the Evangelical churches, so-called, add to this belief. The growing liberality of other Christians, and the steadily constructive tendency of the Unitarians themselves has brought about an increased spiritual sympathy and co-operation with those churches which formerly denied to Unitarians the Christian name, for which they have always contended.

The influence of Unitarianism has been especially notable in the contribution made by its leaders to civic and social betterment. In the field of education the names of Horace Mann, Charles W. Eliot and William G. Eliot, stand pre-eminent. In philanthrophy, the modern methods of charity are referable to Tuckerman; the care of the insane to Dorothea Dix; the cause of emancipation to Garrison, Phillips, and Sumner. It was Henry W. Bellows who organized and conducted the Sanitary Commission, and who put a new construction upon the needs and responsibilities of the soldier in the field. To Thomas Starr King is attributed the influence which saved to the Union the State of California. Nearly the whole school of New England writers produced in the first half of the 19th century were adherents of, and many of them earnest advocates for, the Unitarian faith. What is referred to as the literature of America of that period presents the names of Hawthorne, Lowell, Holmes, Emerson, Longfellow, Parkman, Prescott, Motley, and many others.

Bibliography.—Allen, 'The Liberal Movement in Theology'; Ware, 'American Unitarian Biography'; Sprague, 'Annals of the Unitarian Pulpit'; Ellis, 'Half a Century of the Unitarian Controversy'; Cooke, 'Unitarianism in America'; Works of William Ellery Channing; Sermons by Theodore Parker; Chadwick, 'Old and New Unitarian Beliefs'; 'Life of Channing'; 'Life of Theodore Parker'; Gannett, 'Memoir, Ezra Stiles Gannett'; 'The Christian Examiner'; Farley, 'Unitarianism Defined'; Hedge, 'Reason in Religion'; Clarke, 'Orthodoxy; its Truths and Errors'; Tiffany, 'Life of Dorothea L. Dix'; Frothingham, 'Boston Unitarianism'; 'Transcendentalism in New England'; Savage, 'Our Unitarian Gospel'; Slicer, 'The Great Affirmations of Religion'; 'One World at a Time'; Cobb, 'The Rise of Religious Liberty in America.'

THOMAS ROBERTS SLICER,
Pastor of the Church of All Souls, New York City.

United Armenians, a branch of the Catholic Church in communion with the See of Rome, but retaining the liturgy and ritual of the ancient Armenian Church: they are estimated to number 100,000 souls. In 1830 Pius VIII. nominated a primate for the United Armenians of European Turkey; and as accessions from the Schismatical Armenian Church grew numerous, six suffragan episcopal sees were created 1850. In resentment of the Pope's intervention in the election of their patriarch in 1870 a schism arose, and the United Armenian Church lost upward of 4,000 members: the seceders were excommunicated by the Pope, but they elected a patriarch of their own and came into possession of most of the church property. The schismatical patriarch in 1879 renewed his obedience to Rome,

and his example was followed by many of the clergy and people. The United Armenians live in European and Asiatic Turkey, and in Russia and Austria.

United American Mechanics, Junior Order of, a fraternal and beneficial organization founded in 1853. In 1902 it had a membership of 105,000, with 33 State councils, and 1,300 subordinate councils. In the same year the order paid benefits to the amount of $275,790.

United American Mechanics, Order of, a fraternal and beneficial organization founded in 1845. In 1902 it had a total membership of 48,000, with 20 State councils and 750 subordinate councils. In the same year the order paid benefits amounting to $170,000.

United Baptists, a religious sect in the United States which had its rise in the middle of the 18th century during the great revival of religion under the ministrations of George Whitefield. Owing to differences of opinion among Baptists as to the methods of the revivalists some of them seceded from the churches and were called Separates, while those who remained were distinguished as Regulars: the Separates approved the "new measures," the Regulars condemned them. After a time some members of both factions came together and took the name of United Baptists. Their articles of belief declare that Christ died to make atonement for sin; that sinners freely choose their condition; that baptism should be administered to believers only, and by immersion; and that foot-washing ought to be practised by all baptized believers. The sect exists chiefly in the southwestern States. In 1900 it had in the United States 25 ministers, 204 churches, 13,209 communicants.

United Brethren, called also **Moravians,** a religious sect or society, the *Unitas Fratrum,* the membership of which was made up at first of Moravians or Bohemians, descendants of the first followers of John Huss (q.v.). A party of Moravians or Hussites, fleeing from persecution in their native countries, were, 1722, permitted by the Count von Zinzendorf (q.v.) to settle on his estate, Berthelsdorf in Saxony. Berthelsdorf, new-named Herrnhut, has ever since been the principal seat of the society: hence the name Herrnhuters by which they are known in Germany. Their patron devoted his whole estate to the propagation of Christianity through the ministrations of the Brethren and was the society's chief director and most zealous missioner and evangelist till his death. In Germany they are recognized by the several governments as Protestants attached to the Confession of Augsburg: but they claim for their bishops apostolic succession through the Waldensian Church; their bishops, however, exercise no jurisdiction, their principal function being that of conferring ministerial order. Every congregation is governed by a board of trustees and a board of elders: the whole society or church is governed by synods composed of bishops and deputies of clergy and laity: in the intervals between synods the affairs of the Unitas Fratrum are managed by a conference of elders. There are communities and settlements of the United Brethren in various Christian countries, as Germany, Holland, Britain, North America, and in heathen lands. The Brethren early entered the field of foreign missionary labor; and though numerically the society is not to be compared with the other religious bodies which are represented in that work, it has perhaps the most complete missionary organization in the world. The island of St. Thomas in the West Indies was the first field of their missionary zeal 1732; the following year they planted a mission in Greenland, the fruits of which have been most abundant: their missionary stations are found also in South Africa, Tibet, Labrador, Alaska, and other heathen countries. In 1740 the first communities of the United Brethren were established in Pennsylvania, and in that colony they founded the three towns, Bethlehem, Nazareth, and Lititz. From these centres went forth a large number of devoted Christian men and women who labored with great success among the colonists and the various Indian tribes. At present the American province of the Moravian Church or Unitas Fratrum is divided into two districts, the northern district with its seat at Bethlehem, Pa., the southern with its seat at Salem, N. C. Each of these districts has its own synod. In 1900 the Unitas Fratrum or Moravian Church had in the United States 118 ministers, 111 churches, and 14,817 communicants.

United Brethren of Christ, a denomination of Evangelical Christians which, though not organized and named till 1800, had its origin in 1766 during a revival of religion among the immigrant German population of Pennsylvania and northern Maryland under the ministrations of Philip William Otterbein, a missionary of the German Reformed Church, and Martin Boehm, a minister of the Mennonite sect. By these leaders preachers were licensed and conferences assembled; but not till 1800 did the movement take the form of a church or assume a distinctive title: in that year, at a conference held in Frederick County, Md., the title United Brethren in Christ was assumed and Otterbein and Boehm were chosen bishops. The sect is in no wise related either to the Unitas Fratrum, though that society is also officially styled United Brethren; nor to Methodism: Otterbein and Boehm were preaching the distinctive doctrines of the United Brethren in Christ before there were any Methodists in this country. The theology of the church is Arminian: its form of worship is simple, marked by congregational singing and participation of all members, male and female, in the devotional exercises. The ministers are appointed to their charges by the bishop and presiding elders at an annual conference: the time limit of the pastoral relation is three years, but may be extended indefinitely by consent of the conference: since 1889 women are admitted to the ministry on the same terms as men. Originally the religious services were conducted in the German language: at present only in a small number of the churches is that language employed. The church has a theological seminary and a publishing house at Dayton, Ohio, and in other places nine colleges and several academies. Its missionary society conducts home missions, also missions in Germany and in South Africa. In 1900 the number of ministers of this church in the United States was 1,897, of churches 4,229, of communicants 243,841. Through a schism in 1889, the church lost a portion of its membership, and the seceders formed a separate organ-

ization called United Brethren (Old Constitution). This body had in 1900 670 ministers, 817 churches and 26,643 communicants.

United Christians of Saint Thomas, those of the native Christians of Malabar and Travancor, who are in communion with the Roman See. The Christian Church of Malabar, called the Church of the Christians of Saint Thomas, dates from an early period, perhaps the 6th century, and appears to have from the beginning been in communion with the patriarch of the Nestorians. At the close of the 16th century, under Portuguese domination, this church was brought into communion with Rome. When the Dutch succeeded the Portuguese, the Christians of Saint Thomas renounced the union with Rome, and receiving a metropolitan from the Jacobite patriarch of Jerusalem, adopted the creed and liturgy of the Monophysites; the direct opposite of their original Nestorianism. Throughout these changes a minority of the Christians of Saint Thomas adhered to Rome, and these, with later secessions from the schismatical Jacobite church, number about 100,000, subject to a vicar-apostolic appointed by the pope. They use the Syriac liturgy of the Nestorians, not that of the Jacobites.

United Copts, the small body of seceders from the Monophysite Coptic Church who acknowledge the supremacy of the pope and are in communion with the See of Rome. The church of the United Copts uses the rite of the Monophysite Coptic Church and retains many of the peculiarities of that church in matters of discipline. The United Copts are presided over by a vicar-apostolic appointed by the Sovereign Pontiff.

United Daughters of the Confederacy, a social, literary, historical, monumental and benevolent association, composed of the widows, wives, mothers, sisters and lineal descendants of men who rendered honorable service in the army and navy of the Confederate States, or who served in the civil service of the Confederacy, or of any of the States embraced therein, or who gave personal service to the Confederate cause. It was organized at Nashville, Tenn., 10 Sept. 1894, Mrs. M. C. Goodlett, of that city, being the prime mover. In recognition of this service Mrs. Goodlett was subsequently made a permanent official of the organization, with the title of honorary president and founder. The organization has 555 chapters, located in all parts of the United States, and has a total membership of 26,227.

United Evangelical Church, the official designation of the national church of the kingdom of Prussia. The division of the Protestants of Prussia and all Germany was ever a subject of regret to statesmen and churchmen, and many were the efforts made to effect a union of Lutherans and Calvinists. What amicable conferences had failed to effect, that was at last brought about by autocratic decree in Nassau and Prussia in 1817, in Hesse in 1823, in Anhalt-Dessau in 1827. Neither Lutheran nor Reformed (Calvinist) was required to give up or to make any change in his creed; the two confessions were simply brought under one control — that of a superior church council, the Oberkirchenrath. The monarch, William III. of Prussia, prescribed to the United Evangelical Church a liturgical service that is neither Lutheran nor Calvinistic. In 1900 there were in the United States 478 ministers of the United Evangelical Church, with 985 churches and 60,993 communicants.

United Free Church Methodists, a religious body in Great Britain formed by the amalgamation of two subdivisions of Wesleyanism, namely: The Wesleyan Association which had its rise in 1834 when, upon the removal of one or two influential ministers from the original connection, there resulted a secession; and the Wesleyan Reform Association, another body of seceders from the parent body, in 1849; this secession was caused by the expulsion of several ministers from the Wesleyan Church on charge of insubordination. Soon these two seceding bodies entered into a union as United Free Church Methodists: 40 years after the union of the two bodies the United Methodist Free Church had over 85,000 members, 409 ministers and nearly 3,500 local preachers.

United Free Church of Scotland, the name assumed by the ecclesiastical body formed 31 Oct. 1900 by the union of the Free Church of Scotland (q.v.) with the United Presbyterian Church of the same country.

United Greeks. See GREEK CHURCH.

United Irishmen, a society for political reform founded in Belfast 1794: its aim was to promote union among all the people of Ireland without distinction of creed, for the preservation of their liberties and the extension of their commerce. At that time two thirds of the people of Ireland, the Catholics, were by law excluded from all participation in the government of their country. The first society of United Irishmen consisted wholly of citizens of Belfast, respectable merchants and professional men, all of them Protestants or Presbyterians. The same year a branch society was formed in Dublin, and soon the Dublin society was recognized as the central directing body. In its membership were comprised many young men representative of the best elements of society — scions of ancient houses Anglo-Irish or Celtic, some prosperous Dublin merchants, and many young professional men who after the misfortunes of 1798 rose to eminent distinction in their own country, in France, or in the United States, without recanting any of the principles of the United Irishmen. At first the society was constitutional and not secret: it was made a secret society in 1795, and steps were taken for the enrollment of men preparatory to a general insurrection when the promised aid in men and material should arrive from France. At the close of 1796 there were reported as enrolled 500,000 men, sworn members of the society, of whom 100,000 were more or less provided with arms — muskets and pikes. In the meantime Theobald Wolfe Tone, Arthur O'Connor, Lord Edward Fitzgerald, and other agents of the society had been busy in France, and the Directory had given them assurance that aid would be forthcoming. On 16 Dec. 1796 a fleet of 17 sail of the line, 13 frigates, and 13 smaller ships bearing 15,000 French troops sailed for Ireland from Brest, commanded by Gen. Hoche, Grouchy second in command: this expedition, defeated by continuous violent storms, had to return home without effecting a landing in Ire-

land. In the spring of 1797 adverse winds prevailing for weeks prevented the sailing of a joint expedition of troops of the French and Batavian republics for Ireland. Bonaparte's armée d'Angleterre was made an «army of Egypt» in the spring of 1798, and the long-planned insurrection in Ireland, started without any prospect of aid from France, met with inevitable defeat. After suppression of the insurrection, which was confined to three of the 32 counties, by an armed force of 137,000 men, the chief leaders of the United Irishmen in Dublin and Belfast were first confined in a fortress for four years and then banished; very many of the exiles settled in the United States. Of the 20 leaders confined in Fort George the religious affiliations were: Episcopalians, 10; Presbyterians, 6; Catholics, 4.

United Kingdom. See GREAT BRITAIN.

United Order of the Golden Cross, The, a benevolent and fraternal society, organized at Knoxville, Tenn., 4 July 1876. It was the first organization of this kind to admit women on an equality with men. In 1903 the order had 27,000 members and a total income of $561,359.

United Order of Pilgrim Fathers, The, a fraternal and patriotic organization with headquarters at Lawrence, Mass. It has a membership of 30,000 and an annual income of $472,718 in 1903. In the same year the order paid $451,000 in benefits.

United Presbyterian Church of North America. See PRESBYTERIAN CHURCH IN UNITED STATES OF AMERICA.

United Provinces of Agra (ä'gra) **and Oudh,** owd (formerly the NORTHWEST PROVINCES and OUDH), British India, a province in the north central part of India, bounded on the north by Tibet and Nepal, on the east by Bengal, on the south by the states of the Central India Agency, and on the west by the Rajputana and the Punjab. It consists of Agra (formerly the Northwest Provinces), 83,198 square miles; Oudh, 23,966 square miles; and the native states of Rampur, 899 square miles; and Garhwal, 4,180 square miles. Total area under British administration, 107,164 square miles; grand total, 112,243 square miles. Pop. (1901): Agra, 34,858,705; Oudh, 12,833,077; Rampur, 533,212; Garhwal, 268,885; total, British province, 47,691,782; total, including native states, 48,493,879.

United Secession Church. See PRESBYTERIANISM.

United States, a federal republic composed of States, Territories, one district, and colonies. (See *Political Divisions.*) The main portion of the United States occupies the middle part of North America, extending approximately from 24° 30′ to 49° N. latitude, and from 67° to 125° W. longitude. The northern boundary line, beginning with the Pacific Ocean, is as follows: The fixed line running about southeast in the Strait of Juan de Fuca, midway between the State of Washington and Vancouver Island, to Puget Sound, then north, and northeast, to the Strait of Georgia, then northwest to the 49th parallel; from thence east to the Lake of the Woods; thence along the southern coast of the Lake of the Woods, continuing along Rainy River, through the middle of Rainy Lake, and several other lakes which are expansions of Rainy River, to Lake Superior; north on the northwestern coast of Lake Superior to Port Arthur. From Port Arthur the line continues east through the Great Lakes (except Michigan) and the rivers or straits connecting them, to the Saint Lawrence River; thence about midway to the 45th parallel; thence along the 45th parallel east to Hall's Stream; thence north by east, along Hall's Stream nearly to the 46th parallel; then an irregular highland boundary to the Maine State line; thence along highland lines and the southwest branch of the Saint John River to 46° 45′; thence north 47° 20′; thence northwest to the extreme northerly boundary of Maine. From this point the boundary is along several small lakes and streams tributary to the St. John; thence along the Saint John to the New Brunswick boundary and south in a straight line to the head of Saint Croix River; thence along the Saint Croix River, Grand Lakes, and through Passamaquoddy Bay to the Atlantic Ocean. The southern boundary line between the United States and Mexico is as follows: Beginning at the point on the Pacific coast at 32° it extends east to the Colorado River, south 20 miles along the Colorado, southeast to 31° 20′ N. latitude and 111° W. longitude, east along the line of 31° 20′ for 160 miles; thence north to latitude 31° 47′; thence east to the Rio Grande, and along the Rio Grande southeast, east, and southwest to the Gulf of Mexico. The remaining portion of the southern boundary is defined by the northern and eastern shore line of the Gulf of Mexico; the eastern boundary by the Atlantic Ocean and the western boundary by the Pacific Ocean. The Canadian boundary line is 3,700 miles long; the Mexican boundary line is 2,105 miles long, and the total ocean, lake, and river boundary is 11,075 miles. The greatest length, from the Atlantic to the Pacific, is 3,100 miles and north and south 1,780 miles. Alaska (q.v.), in the northern part of North America; Hawaii (q.v.), in the Pacific Ocean; Porto Rico (q.v.), in the Atlantic Ocean; the Philippines (q.v.), and several small islands in the Pacific (parts of the Eastern Hemisphere), are all included within the United States. The area of the main portion of the United States is 2,970,038 square miles. The area of Alaska is 590,884 square miles; of the Philippines 122,000; Porto Rico, 3,600; Hawaii, 6,740; Tutuila, 200; Guam, 54; making a total of 3,693,516 square miles.

Coast Lines — The coast line is comparatively regular; there are no large indentations, but the largest and most numerous are on the Atlantic coast. The principal arms of the Atlantic are Chesapeake, Delaware, New York, Massachusetts, and Cape Cod bays, and Long Island, Albemarle, and Pamlico sounds. On the coast of the Gulf of Mexico are Mobile, Galveston, and Tampa bays; and on the Pacific coast San Francisco Bay, Bay of Monterey, Puget Sound, and Santa Barbara and San Pedro channels. (For coast lines of Alaska and the island possessions see articles on ALASKA; PHILIPPINES; HAWAII; PORTO RICO, etc.). There are no large islands off the coast of the main portion of the United States. Long Island (q.v.) is the largest; the next important are the islands off the northeast Atlantic coast, and the Santa Barbara (q.v.) group off the southwest Pacific coast. Florida, in the southeast, is the largest peninsula. There are more

good harbors on the Atlantic coast than on the Pacific or Gulf coasts.

Topography.— The main part of the United States presents four physical divisions: two elevated and two lowland regions. The elevated are the Appalachian Mountains (q.v.) in the east, and the Rocky Mountains (q.v.) or Cordillerian system in the west. The eastern lowland mass is along the Atlantic coast, broad at the Gulf of Mexico and narrowing towards the north where the mountains are but a short distance from the ocean. The southern part of the Atlantic lowland joins the central lowland region south of the Appalachian Mountains, and about 70 miles from the Gulf of Mexico. It is much less in extent than the central lowland division but it contains a large population, is the oldest portion settled by Europeans and was the chief battle ground in the war for American independence. The northern and southern parts of this lowland section differ materially in formation and soil. The mountains in the northern part approach the ocean so that the foot-hills are almost at the sea line; the lowlands are in some places really series of low hills, masses of rocks, sandy soil, large areas covered deep with glacial deposits, and with masses of rock formation which show the marks of mighty ice-forces. Beginning with and including the southern portions of New Jersey, and continuing to the Gulf and Florida Strait, is a plain of low, almost level, land, extending in a gradual slope from the mountains to tide water. The soil and climate contribute to the extensive growth of fruits, tobacco, corn, and cotton. The northern section of the Atlantic lowland is a worn-down mountain region, and the southern section at no ancient period was sea-bottom and even now the line of demarcation between the coastal plain and the continental shelf is very slight in many places. This section has received the name of "Tide Water Country," on account of its being a gift to the continent from the sea, and also because many of its rivers are tidal streams for some distance from the ocean. The central lowland lies between and on the lower slopes of the two great uplifts. It is called the Mississippi Valley on account of the greater portion being in the basin of the Mississippi River. The higher slopes, merging into the foot-hill region of the Appalachian on the east and the Pacific on the west, become the plateau lands. The large grassy, almost treeless areas in this section are called prairies. This great lowland region of the United States is a part of the central lowland section of North America, which is called, in Canada, the Hudson Bay and Mackenzie regions. In the southern part of this section are vast areas of flood plains, and also land which at no very remote period was wholly under water. Beginning with the Atlantic plain or lowland at Florida, extending west and including the southern part of the central lowland section, there are broad areas only a few feet above sea-level, in many places less than 100 feet. The northern part of this central section is bounded by the Great Lakes. The divide between the streams that flow into the Great Lakes and those which flow into the Gulf of Mexico, by way of the Mississippi, is very slight. The three long slopes in this division are the one from the northern part to the Gulf; the one from the Appalachian divide on the east to the Mississippi; and the third from the Rocky Mountain divide on the west to the Mississippi. There are numerous sand bars and swamp lands along the southern coast. The eastern slope is shorter and less steep as a whole than the western slope. There are high bluffs along many of the rivers of the western part, even in sections where there are large areas of rolling prairie lands. The huge boulders and mountain peaks of the northwest section seem like outposts on the beginning of the plateau region. In the southwest the lowlands extend around the southern part of many of the mountain chains, so that the greater part of the United States south of the low rocky hills which form the extremity of the Appalachian Mountains, and extending west to the Guadalupe Mountains, is one continuous lowland mass. The mountains in Missouri and Arkansas, south of the Missouri River and just west of the Mississippi, are the most important highlands in this whole section. In Missouri these highlands are called Ozark Mountains or Ozark Plateau, in Arkansas Ouachita Mountains.

Along the Pacific coast is a narrow strip of low land of not sufficient extent to be classed among the great physical divisions, but of great value from an economic point of view. The southern part of this lowland border is considerably wider than that of the northern part. The numerous parallel valleys, in some places valley arms, which are on the eastern border of the Pacific lowland strip, furnish a considerable area of productive farm lands.

The eastern uplift, the Appalachian Mountains, are the older and less extensive of the two great highland sections of the United States. (See APPALACHIAN MOUNTAINS.) They consist chiefly of mountain ranges which are nearly parallel with the Atlantic coast, and extend from near the Gulf of Mexico north into Canada. Nearly all of the western part of the United States, beginning about the 104th meridian, belongs to the Rocky Mountain region. (See ROCKY MOUNTAINS.) This portion of the United States has a greater altitude and extent than the mountain lands of the Atlantic region. The Rocky Mountains extend from Mexico to Canada. The ranges which constitute this group are by no means as regular in arrangement as are the Appalachian chains; some extend nearly parallel with the coast; many lofty ranges are at almost right angles with the north and south ranges, and others run northeast and southwest. Enclosed by ranges of these mountains are the Great Basin (q.v.) and the Yellowstone Park (q.v.). The Great Basin region is a series of basins isolated to all appearances from each other so far as drainage lines, and differing in soil and geological formation. The chief basins are the Carson, Humboldt, and Great Salt Lake. The mountain ranges within the Great Basin trend mostly north and south. The vast area of the volcanic region of the Rocky Mountains contains many extinct volcanoes. On both the eastern and western border are numerous high peaks connected by high plateaus. In the southern part or the portion drained by the Colorado River, is a region of high plateaus crossed by streams which flow through deep cañons, some of which are over 2,000 feet deep. The Grand Cañon (q.v.) of the Colorado is in places 6,000 feet deep.

Hydrography.— The great streams which constitute the drainage systems of the United


UNITED STATES.
Population of places is indicated by different lettering, thus
NEW YORK
Boston
Capitals — State
National
Railroad
MEXICO
GULF OF MEXICO
TROPIC OF CANCER
CUBA
DOMINION OF CANADA
CHICAGO
NEW YORK
PHILADELPHIA
Boston
Baltimore
St. Louis
ARIZONA
NEW MEXICO
IDAHO
NEBRASKA
KANSAS
MISSOURI
ILLINOIS
INDIANA
OHIO
KENTUCKY
MICHIGAN
MISSISSIPPI
ALABAMA
LAKE SUPERIOR
LAKE HURON
LAKE ONTARIO
LAKE ERIE
LAKE MICHIGAN
YUCATAN
Florida Channel

States flow into the Atlantic, direct or through the Gulf of Mexico, and into the Pacific. The large river systems are the Mississippi, the Saint Lawrence, the Columbia, and the Colorado. The Mississippi (q.v.) is the largest, including within its basin nearly all the region in the central lowland section, and a large area of the Rocky and Appalachian mountains. The chief tributary is the Missouri (q.v.) which has a drainage area of about 530,000 square miles. Next in drainage area is the Ohio River (q.v.), the basin of which is over 200,000 square miles; the Arkansas, 185,671 square miles; the Red River, nearly 90,000 square miles. The total area drained by the Mississippi, its tributaries, and other streams which enter the Gulf, is 1,726,000 square miles. The Rio Grande, which also enters the Gulf of Mexico, has one large tributary, the Pecos. Further streams which flow into the Gulf of Mexico are the small Colorado, the Brazos, and others in Texas, and several rivers in Mississippi, Alabama, and Georgia. The Mississippi and its tributaries are navigable for thousands of miles. To the great central waterways is due the early development of the interior of the United States, first as a section with trading posts and forts at convenient places on the navigable streams, and later as a farming and manufacturing region. West of the divide in the Rocky Mountains the drainage is to the Pacific Ocean. Nearly all the rivers, except those in the Great Basin, flow directly, or through a main stream to the open sea. The Colorado River enters the Pacific Ocean through the Gulf of California. The largest river of the Pacific basin is the Columbia (q.v.). Some of the other important rivers are the Sacramento, San Joaquin, Klamath, and a number of short streams. The rivers in California and some of the other valleys follow the course of the valleys, but the Columbia, Colorado, and branches of the Columbia break through the mountains in several places, and thus form high waterfalls and series of cascades. The Columbia has several large tributaries, chief of which is the Snake River (q.v.). The rivers of the Atlantic basin east of the Appalachians have mostly rapid currents, and have had great influence in the development of the manufacturing industries of the country. Many of the streams which flow into the Atlantic, or into wide bays which are arms of the ocean, are tidal streams for some distance inland. (See DELAWARE; HUDSON, etc.) The principal rivers of this basin are the Kennebec, Penobscot, and Manchester in the northeast; the Connecticut, which flows into Long Island Sound; the Hudson, a magnificent stream, alike remarkable for its scenery and its navigable importance, which flows south for 300 miles and contributes to form the harbor of New York; the Delaware, which after a course of 300 miles enters the Delaware Bay and is navigable for large steamers to Philadelphia, a distance of 40 miles; the Potomac, which flows into Chesapeake Bay, and is navigable for the largest vessels to Washington, a distance, including the bay, of 200 miles; and the Savannah, which enters Savannah Bay and is navigable for large vessels for 17 miles, to the city of Savannah, where it forms an important harbor. Besides the rivers, one of the most remarkable features of the United States, as also of Canada, is the chain of large fresh water lakes: Superior, Michigan, Huron, Erie, and Ontario. The lakes drain an area of about 90,000 square miles, and send their waters into the Saint Lawrence, after precipitating the greater part of them in an accumulated mass over the renowned Falls of Niagara (q.v.), which are between Erie and Ontario. The rivers of the United States which flow into the Great Lakes (q.v.) are of no great length. The chief streams are the rivers of northern New York and Vermont, some of which enter the Saint Lawrence River through Lake Champlain; the Genesee River in the west central part of New York, and a number of small streams which enter Lakes Erie, Huron, Michigan, and Superior. (See SAINT LAWRENCE RIVER.) The Red River of the North enters the Atlantic Ocean through Lake Winnipeg and the Hudson Bay. In the interior of the United States are many groups of small lakes which have been mentioned in articles on the different States and Territories. The inland seas or salt-water lakes within the Great Basin are of special interest as being the remnants of large inland seas. The fresh-water lakes in the Appalachian section, and even the Great Lakes, were once much larger than at present. The chief characteristics of the whole drainage system of the United States are that by far the greatest portion of the waters are carried south or in a southern direction, and reach the Atlantic Ocean through the Gulf of Mexico. The Great Lakes with their large outlet, the Saint Lawrence River, receive but a small portion of the drainage; their chief supply comes from the melting snows of the Rocky Mountains. The rivers which enter the Pacific are small streams, except the Columbia and Colorado. The Red River of the North is the largest stream which flows north.

Geology.— In the northeastern portion of the United States metamorphic, Devonian, and igneous rock prevail. Old sandstone, or middle Devonian is found along the shores of the Great Lakes. Older Palæozoic groups are found in Ohio, Wisconsin, Tennessee, and in many parts of the Appalachian region. Along the Rocky Mountains, extending north and south, is a wide belt of cretaceous formations. Tertiary formations prevail in the basin sections of the Rockies; igneous rocks are in the northwest and metamorphic strata along the Sierras. From the Rio Grande almost to the Hudson, the Tertiary formation is prominent. The oldest rock systems, the Archæan and Algonkin are found among the Appalachians. They consist of hard, crystalline rocks, granites, marbles, gneisses, schists, etc. The same formations, igneous and metamorphic, are found in Wisconsin, Minnesota, and portions of the Dakotas. The western part of the United States is much younger than the eastern part. (See *Geology* in articles on the different States and Territories.)

Mineralogy.— Coal is mined in 33 States and a large area of unmined coal deposits is in the Rocky Mountains and Alaska. The anthracite coal is found in the eastern part of Pennsylvania and bituminous coal, varying in grade and value, in many other parts of the United States. East of the Rocky Mountains the total area of coal fields is about 222,000 square miles. Wood was the great fuel article of commerce in the eastern part of the United States until about the middle of the 19th century. Bituminous coal was used to some extent as early as the middle of the 18th century, but

the anthracite coal fields of Pennsylvania were scarcely known until about 1800. The Federal Census of 1900 shows that the output of bituminous coal has doubled every decade since 1870. The total production of coal in 1870, short tons, was 33,003,315; in 1900, 293,298,516. In 1870 the output of the anthracite mines in Pennsylvania was 15,650,270, short tons; in 1901, 67,471,668. In 1870 the combined output of bituminous coal in Pennsylvania, West Virginia, Maryland, Indiana, Illinois, Kentucky, Alabama, Iowa, and Colorado was 16,257,104 short tons, and in 1901, 192,457,611. In 1901 the coal production of the United States exceeded that of Great Britain by 42,790,730 tons. Several causes have contributed to the increase of the amount of coal production. The growing scarcity in the East of the wood supply for fuel, the demand for coal where steam is the motive power in manufacturing, the nearness of markets to the coal fields of Pennsylvania and the region south, and the fact that the mining of coal in the United States is not as laborious nor as expensive as in other parts of the world, all serve to increase the demand for American coal. (See COAL.) Natural gas was in use in New York as early as 1868, and in western Pennsylvania in 1875. In a few years the value of the output of the natural gas fields of Pennsylvania was nearly $19,300,000. From 1880 to 1887 the amount produced declined gradually, but from 1887 to 1901 the output has greatly increased. Other States producing natural gas are Ohio, Indiana, West Virginia, Kansas, and the southwestern part of New York. The production of petroleum (q.v.) in the United States began about 1859. Until 1897 the United States was the great petroleum producer of the world. In 1897 Russia's supply exceeded that of the United States. In 1872 the petroleum product of the United States was 6,293,194 barrels; in 1901 it was 69,389,194. The petroleum-producing States are Pennsylvania, Ohio, West Virginia, Indiana, California, Texas, and Louisiana. Iron ore is found in nearly every State in the Union. The regular mining of iron ore is carried on (1904) in 25 States. Iron was one of the metals mined in the early years of the colonization and settlement of the country. In 1850 the total iron production was 1,560,442 tons (long). In 1901 the amount of the output was nearly 29,000,000 long tons, valued at the mines at nearly $50,000,000. In 1891 the pig iron product of the United States was greater than that of Great Britain. In 1902 the combined pig iron products of Belgium, Germany, and Great Britain were less than those of the United States. In 1901 the United States output was 28,887,479 long tons, of which about 24,006,000 tons were red hematite. The chief varieties are red and brown hematite, and magnetite. The largest deposits of brown hematite are found in Virginia and West Virginia, but in New Jersey and Pennsylvania the magnetite is abundant. Other States which have a large amount and a large annual output of iron are Tennessee, Missouri, Wisconsin, New Jersey, Colorado, and Michigan (northern peninsula). In the Lake Superior region, the northern part of Michigan and the northern part of Wisconsin, a very large amount of iron ore is mined each year. (See sections on *Minerals* in articles on the different States; also MINERALS; IRON.)

In the discovery and colonial days gold was found in the United States, but gold mining in the United States really began in 1848 when placer gold was discovered in California. Gold mines exist in nearly all the Rocky Mountain States and territories, including Alaska, and considerable gold has been mined in the eastern part of the country. (See GOLD.) Silver had been mined prior to 1850 only in small quantities. The discovery and development, in 1859, of the rich Comstock Lode, in the western part of Nevada, directed attention to the vast silver deposits in the Rocky Mountains. For several years succeeding the discovery of silver in Nevada, the United States was the great silver-producing country of the world. Mexico has vast silver deposits equal to if not greater than those in the United States. Colorado, Montana and Utah have extensive silver mines. (See SILVER.) The existence of copper on the south shore of Lake Superior was known as early as the 17th century; but the development of the mines which constitute the present extensive copper works of northern Michigan, began in 1845. In 1901 the output of the Calumet and Hecla mine near Hatfield, was 82,519,676 pounds. Since 1880 copper mines have been opened in Arizona and Montana. In 1901 the Michigan mines yielded 25.9 per cent of the copper of the whole country; Montana, 38.2 per cent; and Arizona 21.7. Other States producing copper to any extent are Utah and California. In 1901 the copper product of the United States was valued at $86,629,266, and the amount of the output was 53 per cent of that produced by the world. The United States ranks first in the production of copper and of lead (see COPPER). As early as 1720, lead was mined in a crude way in Missouri. In 1825 lead mines were opened in Wisconsin, Iowa, and Illinois, in the region near Dubuque. Lead is mined in several of the Rocky Mountain States, chiefly Colorado, Idaho, and Utah. Silver is found in many lead mines of the mountain region. In Missouri and other portions of the Mississippi Valley, zinc is found in the sections containing lead deposits (see LEAD.) Zinc was mined in the eastern part of the country, particularly in the northern part of New Jersey, as early as 1850. In 1901 the total output was 140,822 short tons. The United States ranks second in the world in the amount and value of zinc produced annually, and is a competitor with Spain for first rank in the quicksilver product. Mining of quicksilver began in 1845, in California, thus antedating the gold mining in that State. In 1900 the total product was 2,274,115½ pounds, valued at $1,382,305. Clay suitable for pottery, tile, and brick is found in many parts of the country. The States which produce the greatest amount of clay products are Ohio, Pennsylvania, New York, New Jersey, and Illinois. (See POTTERY.) In 1901 one half of the aluminum (q.v.) of the world was produced in the United States. The amount was 7,150,000 pounds which was valued at $1,920,000. Salt is found in Michigan, New York, Kansas, Ohio, California, Lonisiana, Utah, and Nebraska. In 1901 the total product was 20,566,661 barrels, valued at $6,617,449. (See SALT.) Portland cement is found chiefly in Pennsylvania and New Jersey; gypsum in Michigan, Kansas, Iowa, New York, and Ohio. The United States ranks first in phosphate rock. It is found chiefly in South Carolina, Florida, and Tennessee. In 1901 the total value of all that

RELIEF MAP OF THE UNITED STATES.

MODELED BY THE U. S. SURVEY.

was produced in the United States was $5,316,403. A great variety of stones suitable for building purposes is found in nearly all parts of the United States. Some of the most important are marble and granite; limestone, sandstone, slate, and trap-rock are the most common stones. Mineral springs are found in many sections, and large quantities of the waters are bottled for shipment to all parts of the world. In 1901 the amount of mineral waters sold was 55,771,188 gallons which was valued at $7,586,962. California, Utah, Indian Territory, Kentucky, and Texas produce a considerable amount of asphaltic products, such as asphaltum, gilsonite, asphaltic limestone, and bituminous sandstone. Near Lake Champlain, N. Y., and in Alabama, Georgia, and Pennsylvania is found graphite. Other products found in various sections are mineral paints, soapstone, borax, manganese ore, talc, and pyrite.

Climate.— The main land-mass of the United States is in the temperate zone, and the climatic conditions of the whole country are about what is general in such zones modified chiefly by the great mountains and by the winds. The average annual temperature of the extreme southern part is 75° and of the extreme northern part, 50°. The average temperature for January in the extreme north (exclusive of Alaska) is about 20°; for July, about 60°. The mercury falls as low as 40° below zero in the northern part of Minnesota, and is sometimes as high as 120° in the hot, dry sections of Arizona and Texas. The west winds, which are prevalent in January, and which sweep over large interior areas, lower the temperature, frequently to the minimum. The difference in temperature of places in the same latitude on the Atlantic and Pacific coast is quite marked. That of the Pacific is much warmer than that of the Atlantic. The rainfall is generally the greatest in Washington, Oregon, and Florida, but the humidity is great in the southern portion of Louisiana and other places along the Gulf coast. The region around the Great Lakes has not an excessive humidity; but it is subject to extreme and rapid changes in temperature. This region is also subject to extreme changes in the winds. See *Climate* in article AMERICA; METALLURGY.

Flora.— The forest sections of the United States have been treated in detail in articles on MAINE, MICHIGAN, WISCONSIN, WASHINGTON, NORTH CAROLINA, SOUTH CAROLINA, etc. The variety of the species of trees found in the United States is greater than is found in Europe (q.v.), although nearly all of the European species are here duplicated. The endogens predominate in the United States as a whole, but exogens of considerable size and variety are found in the southern part. The flora of the Atlantic and Pacific basins differ considerably in species and variety. On the treeless plains of the Mississippi basin, the native grasses and small plants are different in species or, if of the same species, they are different in variety from those in other parts of the country. See AMERICA.

Fauna.— See AMERICA — *Fauna;* BEARS; BEAVER; BISON; DEER; WOLF, etc.

Agriculture, Stock-Raising, and Poultry.— The agricultural sections are divided as are the physical regions. The great wheat-growing region is in the Mississippi Valley; the cotton and corn largely in the Gulf States; the semi-tropical fruits in the southern part of California and in nearly all parts of the southern section of the United States. Sugar cane is cultivated in the southeastern and south-central sections, and in Porto Rico. The vast region, not yet (1904) under cultivation, in the western part of the United States is gradually becoming productive farm land as irrigation systems are introduced. The increase in extent of the farm lands may be learned from the Federal Census Reports which show that in 1850 the total acreage of farm land in the United States was 293,560,614, and in 1900, 841,201,546. The proportion of improved to unimproved farm lands varies in different sections. In 1900 (Federal Census) the total land area was as follows:

DIVISIONS	Improved farm acreage	Unimproved farm acreage	Total farm acreage
North Atlantic	38,920,614	26,488,475	65,409,089
South Atlantic	46,100,226	58,197,280	104,297,506
North Central	222,314,099	95,035,375	317,349,474
South Central	80,007,867	177,730,978	257,738,845
Western	27,155,681	66,641,179	93,796,860

The north-central section has not only the greatest acreage of farm land, but the greatest acreage of improved land. In 1900 Iowa (q.v.) led in having 97.4 per cent of the total area in farm lands, of which 85.5 per cent was improved land. Other States having a large proportion of the total area in farm lands are Illinois, Indiana, and Ohio. For size of farms and nature of products see *Agriculture* in the articles on the different States and Territories. See also the articles, AGRICULTURE; CORN; IRRIGATION; SUGAR GROWING AND SUGAR MAKING; WHEAT.

Stock-raising has greatly increased in value since 1850. In the northeastern part and in the northern central section dairying is a most important industry. In 1850 the number of milch cows in the United States was 6,385,000, and in 1900, 17,139,674. Stock raising for the meat and hides is common on the western plains and plateaus. The breed of cattle has been greatly improved. Hogs are raised in large numbers in the corn regions. Sheep are raised in nearly all parts of the northern sections, but they have not increased in numbers or value in the same proportion as cattle and hogs. The greatest increase has been in Montana which ranks as the first sheep-raising State. In the portions of the country where cattle-raising has increased, sheep-raising has declined. Poultry products have increased in amount and value. In 1900 (Government Census) the number (on farms) of chickens, ducks, turkeys, and geese was 250,683,593. See SHEEP; POULTRY; CATTLE; HOGS; MULE.

Fisheries.— The Federal Census for 1900 gives the value of the annual fish-product of the United States as $40,000,000; of which amount $6,326,620 was for exported fish. About 75 per cent comes from the fisheries of the Atlantic States, 5 per cent from the Great Lakes, 5 per cent from the Gulf of Mexico, and 15 per cent from the fisheries of the Pacific States. See *Industries* in articles on the different maritime States.

Manufacturing.— The United States ranks first among the countries of the world in man-

ufacturing. In 1900 the net value of the manufactured products was about a third greater than the value of the manufactured products of Great Britain for the same year. The total manufactures of the country were, in value, about twice that of the farm products. The number of persons employed in agriculture was one fourth greater than those employed in manufacturing. The value of the manufactured products increased twelvefold from 1850 to 1900; the capital employed, fivefold; and the wages paid annually, tenfold. The causes which have contributed to the rapid increase of the manufacturing industries of the United States are chiefly the extensive amount of available raw material and fuel and the facilities for cheap transportation by land and water. The chief natural advantages, which have contributed to make the United States rank as first among the productive countries of the world are an invigorating climate, forests, minerals, an abundance of raw material for food and clothing products. The increase in population has made a corresponding increase in the demand for manufactured products, and the exports have also increased (see COMMERCE). A strong cause not to be overlooked is the way in which the emigrants coming from all portions of the world have contributed various methods and much energy to the development of the land chosen for their home. The kind of machinery and its general use is an important factor. The large manufacturing region (1903) is east of the Mississippi and north of the Ohio and Potomac rivers, but the centre of the manufacturing industries is moving westward. Manufacturing in the Southern States increased from 1870 to 1900 about 3.5 per cent. The leading manufactures are to some extent centralized. Slaughtering and meat-packing centres are near the region where cattle and hogs are raised; and also at good shipping points. The iron and steel industries are largely in western Pennsylvania and eastern Ohio. Cotton goods were once the product of New England mills, and a large amount is still produced in that section, but the cotton factories are increasing in the South, near the great cotton fields. In 1900 the United States ranked first in the number of wage earners employed in the manufacture of textiles, second in the amount of capital, and third in the value of the finished products. In the manufacture of silk the United States ranked second. The total number of manufacturing establishments, in 1900, was 512,276, capitalized for $9,831,486,500. The number of wage earners was 5,314,539, to whom were paid annually as wages, $2,327,295,545. The value of the annual products was $13,010,036,514. The total value of the iron and steel products for 1899 was $98,821,918. Next in amount were slaughtering and meat packing products, $790,252,586; foundry and machine-shop products, $644,990,999; lumbering products, $566,621,755; flour, $560,719,063; men's clothing, $415,256,391; printing and publishing, $347,055,050; cotton goods, $339,200,320; boots and shoes, $261,028,580; woolen goods, $238,744,502. The total value of the food products for 1900 was $1,750,811,817, and textiles, $1,081,961,248. See *Industries* or *Manufacturing* in articles on each one of the States and Territories; also UNITED STATES, INDUSTRIES OF THE.

Government.— The government of the nation is based upon the Constitution of the United States, which was adopted 17 Sept. 1787. To this Constitution amendments were added in the years 1791, 1798, 1865, and 1870, and the amendments are equally binding with the original Constitution. This Constitution, placed before the world the last quarter of the 18th century, was a revelation as to the possibilities of a republican form of government, and the forerunner of a revolution in the methods and manner of governing the masses of people constituting a nation. The "We," which is the first word in the preamble of this famous document, took on a new meaning. In this introduction may be found the reasons for the establishment of this Constitution, thus: "We, the people of the United States, in order to form a more perfect Union, establish Justice, insure domestic Tranquillity, provide for the common defense, promote the general Welfare, and secure the Blessings of Liberty to ourselves and our posterity, do ordain and establish this Constitution for the United States of America." The National Government as distinguished from the State governments, the different departments of the government and the rights and duties of each are all set forth in this Constitution. (See UNITED STATES — INTERPRETATION OF THE CONSTITUTION; UNITED STATES — FEDERAL CONVENTION OF 1787.) The amendment proclaimed to be in force 15 Dec. 1791, consisting of ten articles, has reference to as many subjects. (See CONSTITUTION.) The amendment of 8 Jan. 1798 relates to the judiciary; the amendment of 25 Sept. 1804 defines in detail the manner of procedure for balloting for President and Vice-President by the electors. Article XIII., proclaimed to be in force 18 Dec. 1865 established the freedom from slavery or involuntary servitude (except as a punishment for crime) of all persons within the United States, or any place subject to their jurisdiction. Article XIV., proclaimed to be in force 28 July 1868, relates to citizenship, public debt, and pensions. Article XV., proclaimed to be in force 30 March 1870, relates to the right of citizens to vote regardless of "race, color, or previous condition of servitude." See UNITED STATES — SUFFRAGE IN THE.

Political Divisions.— The United States on 1 Jan. 1904, consisted of 45 States, six Territories, one district, and insular possessions. The States are the 13 original States and others created from parts of the original States or from territory acquired after the Revolution. The first State admitted was Vermont (1791) and the last, Utah (1896). The admission of other States is under consideration. In 1860–1, 11 States seceded but they were readmitted after the Civil War. (See UNITED STATES, SECESSION IN THE.) The first State readmitted was Tennessee, July 1866, and the last one was Georgia, 20 April 1870. The District of Columbia was organized in 1790 and the territories as follows: Indian Territory, 1834; New Mexico, 1850; Arizona, 1863; Alaska, 1868; Oklahoma, 1890; Hawaii, 1900. The insular possessions are the Philippines, Porto Rico, Tutuila, Guam, Wake, and other small islands in the Pacific Ocean. The States and Territories are divided into counties which in Louisiana are called parishes. The counties are subdivided into sections which in New England and New York are called towns; in Delaware, hundreds; in Florida and several other States, districts; in many of the western States and in the Carolinas and Arkan-

sas, townships; in the Virginias and Kentucky, magisterial districts; Louisiana, wards; Alabama, and Mississippi, beats; and Georgia, militia districts. The municipal incorporations are known as villages, towns, boroughs, and cities. In Ohio a minor incorporation called a hamlet is recognized; in other States where the hamlet is recognized it means a small collection of houses near together or an unincorporated village. In some States a large incorporated village is called a town. In all States cities are chartered; in New York villages, and in New Jersey and Pennsylvania, boroughs. In some States cities are independent of the town or township organization, and as Baltimore and Saint Louis, independent of the county organization. The cities of New York and San Francisco comprise the entire counties.

Immigration.— For many years there were no special laws relating to immigration, but for several years (see IMMIGRATION) there have been stringent laws against admitting paupers, contract laborers, diseased persons, and certain classes of criminals. The number of immigrants who landed in the United States during the year ending 30 June 1902 was 648,743; the number refused admission, 4,974; and the number returned within one year after landing, 465. The number of immigrants admitted during the fiscal year ending 30 June 1903, was 921,315. Of this number 209,293 came from Austria-Hungary; 235,552 from Italy; 138,330 from Russia; 42,652 from England; 38,475 from Ireland; 47,334 from Sweden; 51,022 from Germany; 25,107 from Norway. The total from Europe was 869,977; from Asia, 30,753 (20,163 from Japan and 7,505 from Turkey, chiefly Syria); from Africa, South America, Mexico, West Indies, Canada, Australia and adjacent islands, and Central America, 20,585. Of the number who arrived in 1903, 613,146 were men; 243,900 women. Nearly 8,800 of those seeking entrance were refused admittance. See UNITED STATES — THE PEOPLING OF THE; UNITED STATES — THE WESTWARD MOVEMENT IN THE; UNITED STATES — IMMIGRATION INTO THE.

Commerce.— See COMMERCE; UNITED STATES, FOREIGN COMMERCE OF THE; UNITED STATES — THE COMMERCIAL DEVELOPMENT OF THE.

Custom Duties.— The duties imposed by law on merchandise exported or imported are custom duties; but in the United States, in accordance with Section 9 of Article I., "No tax or duty shall be laid on articles exported from any State." Hence the custom duties are the tax imposed by an act of Congress, on merchandise brought from other countries to the United States. There are some modifications, as wearing apparel in actual use, works of art, etc., under certain conditions, etc., are not so taxed. The method of securing a revenue for the maintenance and operation of a nation by levying a tax on imported, and sometimes on exported merchandise, is of ancient origin. In 1789 Congress passed an act known as the "Tariff Act," and which was intended as a means of supplying the necessary revenue for the support of the government. Like all other departments of the National Government, that department which dealt with and has had charge of the support of the government, has grown to massive proportions. This branch of the government is in charge of the treasury department (q.v.) and is under the control of an officer called Commissioner of Customs. The list of dues, or duties, especially the custom duties, were originally called tariffs, from the Spanish word *tarifa*, meaning a price-list. A word nearly similar in form and meaning is in use in the Arabic. The word tariff as now used usually means the duties themselves, and not the list of duties. The history of the growth of the customs department in the United States is closely allied with the history of commerce and manufacturing. The chief aim of the customs laws from 1789 to 1816 was to secure a revenue by indirect taxation; from 1816 to 1842 the protection policy was taken into consideration when framing some new custom laws, and the duties on manufactured articles were increased. From 1842 to the time of the Civil War the friends of a "tariff for protection" were active in advocating their cause and were successful in securing many friends and some favorable laws. The greatest changes in the custom duties of the United States have occurred since 1860, or since the beginning of the Civil War (see TARIFF). In 1903 there were 122 Customs Districts in the United States, chiefly in the States bordering on Canada and in the maritime States and Territories. The custom revenues of the United States for the year ending 30 June 1858 amounted to $41,789,620.96; for 1860, $53,187,511.87; 1861 (affected by the War), $39,582,125.64. In 1862 there was an increase of about $9,500,000; the next year an increase of a little over $20,000,000, and in 1864 the custom duties amounted to $102,316,152.99. The next year they fell to $84,928,260; but since 1866 they have been about $200,000,000 each year. (See MCKINLEY BILL; MORRILL TARIFF ACT; UNITED STATES — THE TARIFF IN THE.) Consult: Goss, 'History of Tariff Administration in the United States'; Hill, 'First Stages of the Tariff Policy of the United States'; Taussig, 'Tariff History of the United States.'

Finance.— The total receipts for the fiscal year ending 30 June 1902, were $684,326,280. The principal sources and amount of revenue were as follows:

Customs	$254,444,708
Internal revenue	271,880,122
Postal service	121,848,074

The chief items of expenditure were, in 1902, for pensions, $138,488,560; postal service, $125,896,531; war department, $114,657,246; navy department, $268,302,025. The sum of the total expenditures for government maintenance and operation for the year ending 30 June 1902 was $593,038,903. The United States notes, $346,681,000, which bear no interest, the interest bearing debt, $931,070,340 (June 1902), the gold and silver certificates, all make a total debt of $1,226,259,245 (1 July 1902). The greater part of the non-interest bearing debt is secured by cash in the treasury. See UNITED STATES — FINANCES OF THE.

Weights and Measures.— The weights in use in the United States are apothecaries', avoirdupois, and Troy. The measures used are, for fluids, liquid measure; for distance and dimension, long or linear measure, square measure, cubic measure, nautical measure, mariners' measure, and surveyors' and land measure. Other measures are dry measure, paper measure, numerical measure, circular measure, and measure of time. See MEASURE.

Banks and Banking.— On 26 May 1781, a resolution was adopted by Congress approving a plan for a National bank, as had been proposed by Robert Morris of Philadelphia. In accordance with this action of Congress, on 31 December of the same year, the Bank of North America was incorporated with a capital of $400,000, of which sum $254,000 was from the United States government. This bank is still in existence in Philadelphia and is one of the National banks. In 1902 there were in the United States 4,131 National banks, with combined capitals amounting to $658,668,159; surplus, $285,623,449; dividends, $64,602,442; net earnings, $99,103,168. The ratio of the net earnings to the capital and surplus was 10.5 per cent; of the dividends to the capital and surplus, 68 per cent; and of the dividends to the capital 9.8 per cent. See BANKS AND BANKING.

Transportation.— See various articles under RAILWAY.

Language.— The official language of the United States is English, and nearly all the inhabitants, exclusive of the insular possessions, talk English; it was the mother-tongue of over 90 per cent of the population of the main portion of the United States in 1904. Only a small proportion of the native whites of foreign parents cannot talk English. In 1900 there were 43.3 per cent of the Indians in the United States, 38.2 per cent of the Chinese, and 61.6 per cent of the Japanese who could not speak English. The majority of the inhabitants of Porto Rico and the Philippines talk Spanish, but English in 1904 was the language of the public schools.

Education.— In the United States there is no National system of education; no National school board or governing power which has any control over the schools of the Union. Each State has its own superintendent of public instruction, school board, board of education, or regents who have some control over the schools of the State. The nature and extent of the control differs in different States and Territories. The Commissioner of Education, a National officer belonging to the department of the interior, has an office and headquarters in Washington, D. C. This office is really a "bureau of information" and is of great benefit to the whole country. Here is compiled the commissioner's annual which contains valuable information regarding the condition and outlook of education throughout the world. A staff of trained workers gather the facts from the whole world, and at all times they are ready to give information on a large number of subjects relating to schools and education. The schools of the District of Columbia may be said to be National, as the whole District is under the control of three commissioners appointed by the President. Those schools are noted for their excellence along many lines, especially in manual training. Smithsonian Institute (q.v.), the Botanical Gardens, the art collection at the Capitol, the Congressional Library (q.v.), the Naval Observatory, and the National Museum may be classed as great National aids in education. There are in all in Washington, 34 libraries owned by the government. They contain about 2,000,000 bound volumes and pamphlets. The Library of Congress contains about 1,150,000 bound volumes and pamphlets. The Army Medical Museum has the largest medical library in the world. The Naval and Military schools are finely equipped and generously supported by the government. In many of the State and private schools of the Union, a United States army officer has charge of military departments. In connection with the Department of Agriculture (q.v.) there are a number of experiment stations in different parts of the country. The Geological surveys, the reports of all the departments, especially those pertaining to the geography, industries, transportation, and commerce of the nation, are much used in all of the leading schools. Another branch of the Federal Government, belonging to the department of the interior, is the Indian work, and connected with it is an educational department. There is a superintendent of Indian schools who has charge of a large number of schools in different parts of the country. In 1903 there were 51 Indian schools supported wholly or in part by the government. The course of study in general use in these schools is similar to that in general use in the elementary schools of the States, together with manual training in domestic affairs and in the ordinary trades and occupations. The system is simple, the object being to fit the Indian youth to be self-supporting American citizens. Among the Indian schools under the government control, Carlisle (q.v.) Pa., is the most famous. There are a number of Indian schools which are supported by churches. The religious order of the Blessed Sacrament, for women, was founded by Mother Katherine Drexel solely for the education of Indians and negroes. They have established a number of Indian schools. In 1900 there were in the government Indian schools 10,499 pupils. Each State and Territory has its own State school organization; but there are no State systems of education. Each city or town has its own system. In 1900 the total number of pupils in the public schools, was 15,341,220, of which 7,734,739 were boys and 7,606,481 were girls. There were 293,759 women teachers, and 127,529 men, making a total of 421,288 teachers. In the schools under the auspices of the Roman Catholic Church there were about 1,010,000 pupils. There were, in 1900, in the United States, 172 public normal schools, 134 private normals, 480 universities and colleges, of which 344 were coeducational. There were 141 colleges for women, 43 technical schools, 96 law schools, 151 medical schools, 154 theological, 53 schools of pharmacy, 54 dental colleges, 432 training schools for nurses, and 13 veterinary schools. A number of States, cities, churches, and private organizations have schools for the deaf, blind, and feeble-minded; also reform schools, kindergartens, and commercial schools. The total number of pupils in all the schools of the United States in 1903 was about 18,000,000. The number of persons over 10 years of age who could not read and write was 6,180,000, of whom 955,843 could read, but could not write. Of the total number 734,764 were whites born of native parents; 2,853,194 were negroes; 96,347, Indians, and 178,847 natives born of foreign parents. Of the total number 1,287,135 were foreign-born whites, 25,396 Chinese, and 4,386 Japanese. There were 1,403,212 persons over 10 years of age who could not speak English. See *Education* in the articles on the different States and Territories; NATIONAL EDUCATIONAL ASSOCIATION; UNITED STATES — THE INTELLECTUAL DEVELOPMENT OF THE.

Religion.— Freedom in religious belief prevails in the United States, and each individual is allowed to practice his religion as he chooses, provided he does not violate the laws of the land nor infringe on the rights of others. Public legislation recognizes no church distinctions, and public funds are not used to support any church or denomination. In 1904 the principal religious denominations, according to membership, in round numbers, were as follows: Roman Catholic, 10,000,000; Methodist Episcopal, 5,400,000; Baptists, 5,000,000; Lutherans, 1,700,000; Presbyterians, 1,500,000; Disciples of Christ, 1,200,000; Christian Scientists, 1,100,000; Jews, 1,000,000; Protestant Episcopalians, 720,000; Congregationalists, 630,000; Mormons, 350,000; United Brethren in Christ, 250,000; Reformed, German and Dutch, 300,000; Friends, Orthodox, 210,000; German Evangelical Synod, 212,000; Dunkards, 95,000; Unitarians, 72,000; Adventists, 56,000; Universalists, 50,000. Other religious bodies, some of whose members are affiliated with the denominations already mentioned, are the Evangelical Association and Salvation Army. See PHILIPPINES; PORTO RICO; UNITED STATES — CIVIL AND RELIGIOUS LIBERTY IN THE; and articles on various religious denominations and sects.

Charities.—The United States bestows special care upon the disabled and needy defenders of the nation. The National Home for Disabled Volunteer Soldiers was established for volunteer soldiers who became permanently disabled while in the service of the government. The managers are certain officers of the army and the President of the United States, the Chief Justice and the Secretary of War, *ex officio*. The Soldiers' Home at Washington, D. C., is a group of buildings in a park of 520 acres. Branches are located as follows: Eastern Branch, Togus, Me.; Western Branch, Leavenworth, Kansas; Central Branch, Dayton, Ohio; Southern Branch, Hampton, Va.; Northwestern Branch, Milwaukee, Wis.; Pacific Branch, Santa Monica, Calif.; Danville Branch, Danville, Ill.; Marion Branch, Marion, Ind.; Mountain Branch, Johnson City, Tenn.; Sanitorium, Hot Springs, S. Dak. The Federal Government gives to each State maintaining a home for disabled soldiers and sailors, $100 a year for each soldier and sailor cared for in the home. There are State soldiers' homes as follows: Youngsville, Calif.; Monte Vista, Colo.; Norton Heights, Conn.; Boise, Idaho; Quincy, Ill.; Lafayette, Ind.; Marshaltown, Ia.; Fort Dodge, Kan.; Chelsea, Mass.; Grand Rapids, Mich.; Minnehaha, Minn.; Saint James, Mo.; Columbia Falls, Mont.; Grand Island, Neb.; Milford, Neb.; Kearny, N. J.; Vineland, N. J.; Bath, N. Y.; Oxford, N. Y.; Lisbon, N. D.; Sandusky, Ohio; Roseburg, Ore.; Erie, Pa.; Bristol, R. I.; Hot Springs, S. D.; Bennington, Vt.; Orting, Wash.; Waupaca, Wis.; Cheyenne, Wyo. A Government Hospital for the Insane is in the District of Columbia, and marine hospitals are located at San Francisco, New Orleans, etc.

Cemeteries.— In the National Cemeteries are interred a large number of soldiers and sailors who died while in the United States service. The unmarked graves show that many of the occupants of the "Nation's Silent Cities" belong to the "unknown dead." The United States National Cemeteries are located as follows: Alexandria, La.; Alexandria, Va.; Andersonville, Ga.; Annapolis, Md.; Antietam, Md.; Arlington, Va.; Ball's Bluff, Va.; Barrancas, Fla.; Baton Rouge, La.; Battle-Ground, D. C.; Beaufort, S. C.; Beverly, N. J.; Brownsville, Texas; Camp Butler, Ill.; Camp Nelson, Ky.; Cave Hill, Ky.; Chalmette, La.; Chattanooga, Tenn.; City Point, Va.; Corinth, Miss.; Crown Hill, Ind.; Culpeper, Va.; Custer Battlefield, Mont.; Cypress Hills, N. Y.; Danville, Va.; Danville, Ky.; Fayetteville, Ark.; Finn's Point, N. J.; Florence, S. C.; Fort Donelson, Tenn.; Fort Gibson, Ind. T.; Fort Harrison, Va.; Fort Leavenworth, Kan.; Fort McPherson, Neb.; Fort Scott, Kan.; Fort Smith, Ark.; Fredericksburg, Va.; Gettysburg, Pa.; Glendale, Va.; Grafton, W. Va.; Hampton, Va.; Jefferson Barracks, Mo.; Jefferson City, Mo.; Keokuk, Ia.; Knoxville, Tenn.; Lebanon, Ky.; Lexington, Ky.; Little Rock, Ark.; London Park, Md.; Marietta, Ga.; Memphis, Tenn.; Mexico City, Mex.; Mill Springs, Ky.; Mobile, Ala.; Mound City, Ill.; Nashville, Tenn.; Natchez, Miss.; New Albany, Ind.; New Berne, N. C.; Philadelphia, Pa.; Poplar Grove, Va.; Port Hudson, La.; Quincy, Ill.; Raleigh, N. C.; Richmond, Va.; Rock Island, Ill.; Saint Augustine, Fla.; Salisbury, N. C.; San Antonio, Tex.; San Francisco, Cal.; Sante Fé, N. M.; Seven Pines, Va.; Shiloh, Tenn.; Soldiers' Home, D. C.; Springfield, Mo.; Staunton, Va.; Stone River, Tenn.; Vicksburg, Miss.; Wilmington, N. C.; Winchester, Va.; Woodlawn, N. Y.; Yorktown, Va.

Population.— In 1903 the population of the United States, exclusive of the insular possessions, was more than that of all the rest of the population of North and South America. The increase in the 19th century was remarkably great; a very large part was by immigration. The Federal Census reports taken every 10 years, are compiled from carefully prepared lists made by the officials appointed by the Government Superintendent. The whole country is divided into districts, and each district is under a supervisor who reports to the general superintendent. Each district is divided into smaller or enumeration districts, and one person is assigned for each of the small divisions. In the month of June the canvass is made, each enumerator going from house to house in every part of his territory. In 1900 there were 300 districts. It requires months to tabulate the reports, which work is done under the direct supervision of the superintendent at Washington. In June 1900 there were in the United States, including Alaska, a total population of 76,303,387 persons, of whom 39,050,242 were males and 37,244,145 were females. There were 8,840,789 negroes; 119,050 Chinese; 85,986 Japanese; 266,760 Indians. The State of New York had 7,268,894; Pennsylvania, 6,302,115; Illinois, 4,821,550; Ohio, 4,157,545; Missouri, 3,106,665; Texas, 3,048,710; Massachusetts, 2,805,346; Indiana, 2,516,462; Michigan, 2,420,982; Iowa, 2,231,853; Georgia, 2,216,331; Wisconsin, 2,069,042; Tennessee, 2,020,616. The following States had (1900) a population of over 1,000,000 and less than 2,000,000: Alabama, Arkansas, California, Kansas, Louisiana, Maryland, Minnesota, Mississippi, Nebraska, New Jersey, North Carolina, South Carolina, and Virginia. Three cities, New York, Philadelphia, and Chicago, had each a population of over 1,000,000. New York City has a larger popula-

tion than any State in the Union except New York, Pennsylvania, Illinois, and Ohio. In 1900, the cities had 40.2 per cent of the total population, and the country districts 59.8 per cent. There were 25.6 persons to the square mile, taking into account the large uninhabited tracts. In England there are 600 persons to the square mile. In Massachusetts the proportion is 348.9 persons to the square mile; Rhode Island, 407.0; New Jersey, 250.3. See CENSUS; POPULATION; AMERICA, UNITED STATES OF.

History. — See UNITED STATES — OUTLINE HISTORY OF THE, and various other historical articles in this encyclopedia. B. ELLEN BURKE,
Editorial Staff, 'Encyclopedia Americana.'

United States, Foreign Commerce of the. The story of the foreign commerce of the United States is largely the story of the nation's progress. Commencing business 128 years ago with only determination and opportunity as capital, the results achieved are so stupendous that the record reads like a fairy tale. Never before in the commercial history of the world has any nation built up so large a foreign commerce in so short a time. Never before has any country encountered and overcome such gigantic difficulties. Never before has any people realized such enduring results. From the struggling colonist, practically without a place in the world's commerce, has developed the well-equipped American, with his hand on the lever of the world's trade.

According to the data published by the Department of Commerce and Labor, through its Bureau of Statistics, the record of our foreign commerce for the fiscal year ending 30 June 1903, is:

EXPORTS	
Domestic products and manufactures	$1,392,231,637
Foreign products and manufactures	27,906,377
Gold	47,090,595
Silver	44,250,259
Total exports	$1,511,478,868

IMPORTS		
Merchandise	$1,025,751,538	
Gold	44,982,027	
Silver	24,163,491	
Total imports		$1,094,897,056
Total foreign commerce of 1903		$2,606,375,924

Field and forest, factory and forge, mine, river and lake, all contributed toward this great volume of exports in 1903 in the following proportions:

DOMESTIC		Per cent
Products of agriculture	$ 873,285,142	62.72
Products of manufacture	408,187,207	29.32
Products of mining	38,844,759	2.79
Products of forest	57,830,778	4.15
Products of fisheries	7,755,232	.56
Miscellaneous	6,328,519	.46
Total domestic exports	$1,392,231,637	100.00

The imports in 1903 comprised:

DOMESTIC		Per cent
Food and live animals	$ 218,319,765	21.28
Crude articles for domestic industries	375,150,947	36.58
Manufacturer's materials	114,320,720	11.15
Manufactured articles	170,389,105	16.61
Luxuries, etc	147,571,001	14.38
Total imports	$1,025,751,538	100.00

For customs purposes the classification was:

DOMESTIC		Per cent
Free of duty	$ 426,181,966	41.55
Dutiable	599,569,572	58.45
Total	$1,025,751,538	100.00

The rapidity of our consuming power is evidenced by the following:

Imports entered for immediate consumption	$ 879,863,312
Imports entered for bonding in warehouse	145,888,226
Total	$1,025,751,538

By countries, in their order of importance as customers, the distribution of our foreign commerce, in 1903, was:

	Exports to	Imports from
United Kingdom	$524,691,638	$191,666,505
Germany	193,555,495	119,837,908
Canada	123,472,416	54,660,410
Netherlands	78,245,419	22,710,673
France	77,542,436	91,060,702
Belgium	47,073,160	22,766,830
Mexico	42,227,786	41,254,542
Italy	35,022,660	36,368,860
British Africa	33,788,629	971,908
British Australasia	32,748,580	6,969,017
Cuba	21,769,572	62,341,942
Japan	20,924,862	44,142,562
Chinese Empire	18,603,369	26,769,612
Spain	17,626,084	8,474,528
Denmark	16,144,935	600,193
Russia in Europe	16,122,628	9,239,782
Argentina	11,430,496	9,463,832
Brazil	10,738,748	67,216,348
Sweden and Norway	10,160,874	4,905,234
British West Indies	10,137,055	13,454,557
Hongkong	8,780,741	1,355,444
Austria-Hungary	7,209,855	10,578,702
British East Indies	4,795,411	49,774,589
Colombia	4,293,295	4,184,149
Chile	4,038,875	9,377,313
Philippine Islands	4,038,909	11,372,584
Portugal	3,652,194	3,488,185
Peru	2,971,411	2,703,643
Newfoundland and Labrador	2,509,415	868,238
Portuguese Africa	2,324,216	
Haiti	2,383,424	1,107,734
British Guiana	1,936,524	3,351,656
Venezuela	1,878,202	5,312,954
Costa Rica	1,858,604	3,731,523
French West Indies	1,611,002	19,538
Aden	1,508,999	2,328,654
Uruguay	1,505,100	2,981,632
Santo Domingo	1,390,967	2,833,676
Nicaragua	1,399,696	1,862,217
Ecuador	1,352,162	1,726,851
Bermuda	1,327,626	592,107
Dutch East Indies	1,194,510	16,277,606
Guatemala	1,128,045	2,400,063
Dutch West Indies	977,559	406,249
Honduras	956,193	1,373,131
British Honduras	868,578	376,967
Canary Islands	815,463	42,547
Asiatic Russia	802,428	28,230
Salvador	797,253	891,987
Egypt	740,375	10,661,978
Russian China	681,756	1,655
Danish West Indies	633,710	734,020
Dutch Guiana	555,398	874,454
French Africa	410,097	450,690
Walta, Gozo, etc	453,529	20,043
Gibraltar	427,005	6,471
Turkey in Europe	496,785	5,672,578
Azores and Wadara Islands	369,405	16,588
French Guiana	351,262	215,811
French Oceania	398,169	579,457
Greece	330,554	1,326,935
Turkey in Asia	276,247	4,897,428
Rumania	256,927	6,554
Switzerland	205,647	17,784,855
Miguelon, Langley, etc	191,150	18,668
Korea	171,400	
French East Indies	131,692	10
German Oceania	120,041	25,442
British Oceania	98,669	2,087,812
Bolivia	49,107	1,500
Liberia	29,086	2,747
Madagascar	19,278	10,450
Paraguay	13,021	2,887
German Africa	6,313	29,526
French China	4,300	
Spanish Africa	2,266	20,404
British China	1,670	22,355
Greenland, Iceland, etc	508	100,606
Portuguese East Indies	78	28
Servia		25,263
Italian Africa		2,584

By world grand divisions this tabulation summarizes as:

	Exports to	Imports from
Europe	$1,029,587,728	$550,056,518
North America	215,640,051	188,927,569
Asia and Oceania	95,362,503	166,854,802
South America	41,114,601	107,413,030
Africa and all other	38,433,131	12,499,610
Totals	$1,420,138,014	$1,025,751,538

Exclusive of gold and silver exports and imports.

To convey the water-carried portion of this vast commerce we had to employ:

Steam tonnage	54,715,306
Sailing tonnage	7,707,775
Total tonnage employed	62,423,081

Analyzing our domestic exports, we find the lines of which we exported $10,000,000 worth or more, to be as follows:

Agricultural implements	$21,006,622	
Animals	34,781,193	
Corn	40,540,637	
Wheat	87,795,104	
Wheat flour	73,756,404	
(Total Breadstuffs, $221,242,285)		
Carriages, cars, etc	10,499,195	
Chemicals, drugs, dyes, and medicines	13,697,601	
Coal	21,206,498	
Copper (not ore)	39,667,196	
Cotton, raw	316,180,429	
Cotton manufactures	32,216,304	
Fruits and nuts	18,057,677	
Iron and steel manufactures	96,642,467	
Including builder's hardware		12,064,824
Wire		5,172,140
Electrical machinery		5,779,459
Sewing machines		5,105,85:
Locomotives		3,219,778
Typewriting machines		3,966,741
Pipes and fittings		5,431,459
Leather, and manufactures of	31,617,389	
Including boots and shoes		6,665,017
Naval stores	12,918,708	
Oil-cake and oil-cake meal	19,743,711	
Mineral oils	67,253,533	
Vegetable oils	16,234,362	
Paraffin and paraffin wax	9,411,294	
Meat and dairy products	179,839,714	
Seeds	9,455,283	
Tobacco, and manufactures of	40,444,689	
Wood, and manufactures of	57,743,535	

Treating the imports in the same way we have:

Chemicals, drugs, and dyes	$64,347,535
Coal	10,562,005
Coffee	59,200,749
Copper, and manufactures of	17,505,247
Cotton, raw	10,970,671
Cotton manufactures	52,462,684
Earthen, stone, and china ware	10,512,052
Fibers, unmanufactured	34,462,513
Fibers, manufactured	39,334,521
Fruits and nuts	23,726,636
Hides and skins (not furs)	58,031,613
India rubber, and manufactures of	39,997,232
Iron and steel (not ore)	51,617,312
Diamonds, uncut	10,933,188
Diamonds, cut	15,580,522
Leather, and manufactures of	11,294,167
Oils	12,283,957
Silk, raw	50,011,819
Silk manufactures	35,962,854
Spirits, wines, etc	10,249,296
Sugar	74,114,291
Tea	15,650,229
Tin	23,618,802
Tobacco, and manufactures of	17,234,449
Wood, and manufactures of	28,744,040
Wool, unmanufactured	22,155,096
Wool, manufactures	19,545,721

The total of $2,606,375,924 for our foreign commerce in 1903 is such a gigantic result to reach in the short space of 128 years, that it will be profitable and interesting to note the steps by which we have attained it. They are, beginning with 1790—our earliest year of record—as follows:

Years	Imports	Exports	Total
1790	$23,000,000	$20,205,106	$43,205,106
1810	85,400,000	66,757,970	152,157,970
1830	62,720,956	71,670,735	134,391,691
1850	173,509,526	144,375,726	317,885,352
1870	435,958,408	392,771,768	828,730,176
1890	789,310,409	857,828,684	1,647,139,093
1900	849,941,184	1,394,483,082	2,244,424,266
1901	823,172,165	1,487,764,991	2,310,937,156
1902	903,320,948	1,381,719,401	2,285,040,349
1903	1,094,897,056	1,511,478,868	2,606,375,924

For this 114 of our 128 years of commercial history, the grand total of our foreign commerce was:

Exports	$37,954,672,629
Imports	34,348,441,329
Grand total	$72,303,113,958

One's mind has difficulty in grasping the size and force of these figures. Think of the vast and varied intercourse and the more than imperial profits which have come to our nation, as a result of this more than seventy-two thousand million dollars' worth of merchandising between it and the other nations of the world, in only 114 years.

It is beyond the power of imagination to picture all, or even a fair part, of the collateral activity and profit which have been the natural accompaniment of this mammoth volume of foreign commerce—the bulk of which has been transacted within the single generation since 1870. The gain in that period was:

1903 Imports and exports	$2,606,375,924
less 1870	828,730,176
gain in 33 years	$1,777,645,748

Nationally speaking, it stands to reason that all we receive from foreign countries, in cash or its equivalent, for what we sell to those countries, over and above what we buy from them, increases our wealth as a nation. In that view we note:

114 years' exports	$37,954,672,629
less imports	34,348,441,329
Added to our wealth	$ 3,606,231,300

Note some of our recent gains in exports:

Exported to	1894	1903
United Kingdom	$431,059,267	$524,691,638
Austria-Hungary	527,509	7,209,855
Belgium	28,422,089	47,073,160
Denmark	5,050,837	16,144,935
France	55,315,511	77,542,436
Germany	69,387,905	193,555,495
Italy	13,910,620	35,022,660
Netherlands	43,670,312	78,245,419
Russia in Europe	6,827,475	16,122,628
Spain (1897)	10,912,475	17,626,084
British North America	58,313,223	125,776,203
Mexico	12,842,149	42,227,786
Porto Rico	2,720,508	11,976,134
Hawaii	3,306,187	10,787,666
Philippine Islands	145,466	4,028,677
British Australasia	8,131,939	32,748,580
British Africa	3,983,833	33,788,629
Japan	3,986,815	20,924,862
Hongkong	4,209,847	8,780,741
Chinese Empire	5,862,426	18,603,369
All South America	33,212,310	41,113,601
All Oceania	11,972,521	37,468,512
All Africa	4,923,859	38,436,853
All Asia	21,467,848	58,359,016
All North America	119,693,212	215,482,769
All Europe	700,870,822	1,029,587,728

By world grand divisions these recent increases are:

Europe	$328,716,906
North America	95,789,557
Asia	36,891,168
Africa	33,512,994
Oceania	25,495,991
South America	7,902,291
Total increase, 1903 over 1894	$528,308,907

On the other hand, the increase in our imports in 1903 over 1894, is shown by the following table to be, in world grand divisions:

Imports	1894	1903
Europe	$295,077,865	$550,056,578
North America	166,962,559	188,927,569
South America	100,147,107	107,413,030
Asia	67,847,036	147,702,374
Oceania	21,480,717	21,043,527
Africa	3,479,338	12,581,651

This tabulation analyzes for increases of imports as:

Europe	$254,978,653
Asia	79,855,338
North America	21,965,010
South America	7,265,923
Africa	9,102,313
Oceania, decrease	437,190
Net increase, 1903 over 1894	$372,730,047

The net result of this 1894–1903 comparison is:

Exports increase	$528,308,907
Less imports increase	372,730,047
Balance of increase, our favor	$155,578,860

Reference has been made to the fact that by far the larger part of the enormous increase in imports has been since 1870. The good effect of this upon the revenues of the government is shown in the following table of import duties collected:

Years	Import duties collected
1870	$194,538,374
1875	157,167,722
1880	186,522,064
1885	181,471,939
1890	229,668,584
1900	233,164,871
1901	238,585,455
1902	254,444,708
1903	284,479,581

The regrettable, and the only regrettable, feature in connection with the foreign commerce of the United States, is the decreasing use of American ships as carriers of American imports and exports. The following table exemplifies this feature:

Years	Per cent in American ships	Years	Per cent in American ships
1870	32.8	1895	11.7
1875	26.2	1900	9.3
1880	17.4	1901	8.2
1885	15.5	1902	8.8
1890	12.9	1903	9.1

The slight improvement in the years 1901–3 over 1900, is encouraging as a hope, faint though it be, of better days for American shipping engaged in American foreign commerce.

An encouraging feature of our foreign commerce is that exports have more than kept pace, per capita, with the increase in population, in spite of international trade fluctuations. Witness the table which follows:

Years	Population	Per cent per capita
1871	39,555,000	$10.83
1875	43,951,000	11.36
1880	50,155,000	16.43
1885	56,148,000	12.94
1890	62,622,000	13.50
1895	68,934,000	11.51
1900	76,303,000	17.96
1901	77,647,000	18.81
1902	79,003,000	17.16
1903	80,372,000	17.32

We began the generation with $10.83 of exports per capita of our population, and finished it with $17.32 per capita. High-water mark was $18.81 per capita in 1901; but it is to be noted that in spite of intervening commercial depressions and panics our exports per capita have, since 1871, always bettered the figures of that year.

Another striking encouragement is the growing importance of exported manufactures in their relation to our total exports, by percentage thereof. A few figures show this:

Years	Per cent of total export	Years	Per cent of total export
1875	16.57	1895	23.14
1885	20.25	1903	29.28

There were fluctuations in the intervening years, by reason of world wide depressed business conditions, but the fact remains that manufactures exported in 1903 formed 12.71 per cent more of our total exports than in 1875. This is particularly encouraging as the busy factory insures a working people, and a working people is a progressive people. A few more percentages of individual exports to total exports are worth noting.

	1871 Per cent	1880 Per cent	1890 Per cent	1900 Per cent	1903 Per cent
Agricultural products, all	70.74	83.25	74.51	60.98	62.73
Cotton, raw	72.39	65.73	68.15	65.18	65.01
Wheat and wheat flour	22.30	40.18	22.31	34.00	30.28
Corn and corn meal	0.98	6.43	4.85	10.30	3.04

The increase in manufactures exported, the size of crops in our own and other countries, and our continually increasing home demand, more than pro rata per capita for agricultural products, account for the fluctuations in this record.

To properly judge of the extensive bearing of our agricultural industry upon our export trade we must look at some of the yearly values of agricultural products exported.

Years	Agricultural exports
1870	$361,188,483
1880	685,961,091
1890	629,820,808
1900	835,858,123
1903	873,285,142

By these figures it is shown that we are within reaching distance of exporting enough agricultural products each year to equal our net public debt of $925,011,637. In this connection the following quotation from the 1903 annual report of the Hon. James Wilson, secretary of agriculture for the United States, is in order:

"During the last fourteen years there was a

balance of trade in favor of farm products, without excepting any year, of $4,805,000,000. Against this was an adverse balance of trade in products other than those of the farm of $865,000,000, and the farmers not only canceled this immense obligation (by their exports), but had enough left to place $3,940,000,000 to the credit of the nation when the books of international exchange were balanced. It is the farmers who have paid the foreign bondholders."

Note also the progress we have made since 1870, in classes of exports other than agricultural products.

	1870	1903
Mining	$ 5,026,111	$ 380,844,759
Forest	14,897,963	57,830,778
Fisheries	2,835,508	7,755,232
Manufactures	68,279,764	408,187,207
Miscellaneous	2,980,512	6,328,519

Exports of nearly three times as much in agricultural products; of more than seven times as much in mining products; of nearly four times as much in forest products; of nearly three times as much in products of fisheries; of six times as much in manufactures, and all in a single generation, is a record never before attained by any nation in the world. And what shall we say of the future of American foreign commerce? From what has been accomplished, what may we not expect to accomplish? As in the years gone by we bent our energies to capture the "golden Argosies of the West," so now, our expectations are toward the commerce of the mystic East. In the vast trade developed, and the vaster trade to be developed, of those densely peopled lands, lies the commercial supremacy of the future. Is that supremacy to be ours? Let the American Panama Canal answer; let our firm foothold in the Philippines answer; let our cordial relations with China and Japan answer; let the American Pacific cable answer; let our possession of Hawaii and Guam — those milestones of the Pacific answer; let our successful fight for the "open door" in China answer. We need not fear the answer. In a few years — not more than eight or ten — American ships with "Old Glory" flying at each mast head, loaded to the gunwales with American products and manufactures, will gaily set sail from American ports on the Atlantic, pass through the American Panama Canal into the Pacific, and, making morning calls at American Honolulu and American Manila, sail on to China, Japan, and the other inviting lands of the Orient and the Far East, and returning, laden with needed products of the American Philippines, with the wares and products of China and Japan, will show to all nations, that supremacy in the world's foreign commerce will be with the United States of America.

WALTER J. BALLARD,
Schenectady, N. Y.

United States, Industries of the. The industries of the United States are many and varied, and of colossal proportions: the minerals of the mines, the timber of the forests, the fish of the lakes, rivers, and adjoining seas, the products of the farms, the outputs of the factories, and the thousand and one forms of collateral industry, which American energy and aptitude are continuously devising. There is no limit to American ingenuity and energy in adapting themselves to all the requirements of continually developing lines of industry, no matter how sudden the call. The range of that ingenuity is boundless, and its application untiring.

For statistical purposes, American industries are classified as Agriculture, Manufactures, Mining, Forest, Fisheries, Miscellaneous. It is the purport of this article to review them in that order, using the figures of the census of 1900 — the Twelfth Census of the United States — when later, complete figures are not available. An endeavor will be made to show the steps by which the present gigantic exhibits have been reached, starting from the earliest available records, since the birth of the American nation. The people who have accomplished the great results hereafter shown — great indeed if they had been entirely accomplished by a people numbering all the time, as many as the present population — have been firm in faith, strong in purpose, constant in effort, undaunted by obstacles, magnificent in enterprise, fertile in resource, full of self-reliance, asking only "A fair field and no favor." Moved and inspired by these great motives, they have gone on and on, till the industries of the United States already outclass those of any other nation in the world. In this connection it is interesting to note the stages by which our present population, in our continental area only, of 82,000,000, has been reached. The record is as follows:

YEAR	Population
1800	5,308,483
1820	9,658,453
1840	17,069,453
1860	31,443,321
1880	50,155,783
1900	76,303,387
1904 (estimated)	82,000,000

A more than 15-fold growth in only 104 years of American history.

Towards this result foreign nations have contributed:

PERIOD	Immigrants arrived
1800 to 1820 (estimated)	200,000
1821 to 1830	143,439
1831 to 1840	599,125
1841 to 1850	1,713,251
1851 to 1860	2,598,214
1861 to 1870	2,314,824
1871 to 1880	2,812,191
1881 to 1890	5,246,613
1891 to 1900	3,844,420
1901 to 1903	1,993,707
1904 (estimated)	750,000
Total, 104 years	12,215,784

As our increase in population in the 104 years has been nearly 80,000,000, this tabulation proves that nearly three fourths of our growth in population, has been native-born Americans; children, including those of foreign-born parents, who have been reared in America, and imbued with the dauntless spirit of "dare and do," which is purely American. Herein is the secret of our success. This growing population has been, and is, distributed over a growing area, of which the following is the record:

CONTINENTAL UNITED STATES ONLY.

YEAR	Area, square miles
1800	827,844
1810	1,999,775
1820	2,059,043
1850	2,980,959
1860	3,025,000
1900	3,025,000

Attention is drawn to the fact that our continental area is the same as it was 40 years ago. Figures of production, etc., hereafter given show the enormous strides we have made in that forty years, without any increase in our continental area.

Turning now to our industries, as classified:

AGRICULTURE — THE FIGURES PRIOR TO 1850 NOT AVAILABLE.

Year	Number of farms	Acreage
1850	1,449,073	293,560,614
1860	2,044,077	407,212,538
1870	2,659,985	407,735,041
1880	4,008,907	536,081,835
1890	4,564,641	623,218,619
1900	5,737,372	838,591,774

VALUE OF FARM PROPERTY.

1850	$ 3,967,343,580
1860	7,980,493,063
1870	11,124,958,747
1880	12,180,501,538
1890	16,082,267,689
1900	20,439,901,164

Herein we note a growth in the 40 years, 1860–1900, of:

Number of farms	3,693,295
Acreage	431,379,236
Value of farm property	$12,459,408,101

Here we see that the growth in this forty years exceeds the entire growth from the beginning of our colonial and national existence, to 1860, by the following:

Number of farms	1,649,218
Acreage	24,166,698
Value of farm property	$4,478,915,038

The 1900 total value of farm property represents:

Farm land and buildings	$16,614,647,491
Implements and machinery	749,755,970
Live stock	3,075,477,703

The full significance of this value of $3,075,477,703 in farm live stock is seen in the following:

	Number
Cattle	67,804,022
Horses	18,266,140
Sheep	61,605,811
Mules	3,366,724
Swine	62,876,108

The census of 1900, gives the value of our farm products in 1899, as:

Continental United States	$4,717,069,973
All United States	4,739,118,752
which divides into,	
Fed to live stock	$ 974,941,046
Not fed to live stock	3,764,177,706
Total value	$4,739,118,752

and has been reached by the following stages:

Year	Value (Not fed to live stock)
1870	$1,958,030,927
1880	2,212,540,927
1890	2,460,107,454
1900	3,764,177,706

The enormous increase in the value of the farm products of 1900 over that of 1890, namely, $1,304,070,252, or $379,000,000 more in one year, than the entire interest-bearing debt of the country ($925,000,000), almost staggers belief, but it is a fact. That is the reason why after feeding 82,000,000 people, we are able to export $873,000,000 worth of agricultural products in 1903 fiscal year; a sum equal to, as the Chicago *Record-Herald* said, "Almost $3,000,000 for every working day of the year, which means $125,000 an hour, $2,000 a minute, or $33 a second. Every time the clock ticked on every one of the days throughout that working year, $33 worth of our farm products found its way abroad, and three $10 gold pieces (and $3 more) started on their way back to the United States." Farm products comprise 62.72 per cent of our exports.

The products of our farms in 1900 classified as:

Class	Value
Animal products	$1,718,990,221
Forest products	109,989,868
All crops	2,910,138,663
Total value	$4,739,118,752

In their order of importance, the various crops making up this total of $2,910,138,663 were:

Crops	Quantity (Bushels when not otherwise stated.)	Value
Corn	2,666,324,370	$828,192,388
Hay and forage, tons	84,010,915	484,254,703
Wheat	658,534,252	369,945,320
Cotton, bales	9,534,707	323,758,171
Oats	943,389,375	217,098,584
Vegetables, value only		113,644,398
Forest products, value only		109,989,868
Potatoes	273,318,167	98,380,110
Orchard products	212,365,600	83,750,961
Tobacco, pounds	868,112,865	56,987,902
Cotton-seed, tons	4,566,100	46,950,575
Barley	119,634,877	41,631,762
Small fruits, value only		29,029,757
Sugar cane and products, value only		20,541,636
Sweet potatoes	42,517,412	19,869,840
Flaxseed	19,979,492	19,624,901
Flowers and plants, value only		18,758,864
Grapes, centals	13,009,841	14,090,234
Rye	25,568,625	12,290,540
Nursery products, value only		10,123,873
Sub-tropical fruits, value only		8,227,838
Dry peas	9,440,210	7,908,966
Dry beans	5,064,490	7,633,636
Peanuts	11,964,109	7,270,515
Onions	11,790,974	6,637,413
Rice, pounds	250,280,227	6,329,562
Buckwheat	11,233,515	5,747,853
Clover seed	1,349,209	5,359,578
Sorghum syrup, gallons	16,972,783	5,288,083
Hops, pounds	49,209,704	4,081,929
Broom corn, pounds	90,947,370	3,588,414
Sugar beets, tons	793,353	3,323,240
Grass seed	3,515,869	2,868,839
Nuts, value only		1,949,931
Maple syrup, gallons	2,056,611	1,562,451
Kaffir corn	5,169,113	1,367,040
Maple sugar, pounds	11,928,770	1,074,260
Miscellaneous seeds, value only		826,019
Sorghum cane, tons	291,703	815,019
Hemp, pounds	11,750,630	546,338
Peppermint, pounds	187,427	143,618
Castor beans	143,388	134,084
Chicory, pounds	21,495,870	73,627
Willows, value only		36,523
Besides many other small crops too numerous to schedule, of the total value of		1,120,343

Some of our other farm productions in 1899 were:

Dairy produce	$472,369,255
Poultry	136,891,877
Eggs	144,286,158
Bees, honey, and wax	4,109,626
Wool, mohair, and goat hair	45,723,739

The $109,989,868 of forest products consisted of:

	Trees	Product, pounds
Almond	1,649,072	7,142,712
Cocoanut	48,919	145,000 (number)
Pecan	643,292	3,206,850
Walnuts	726,798	10,668,065
Miscellaneous	634,460	380,224 (bushels)

IRRIGATION IN 1899.

Number of irrigators	110,523
Cost of irrigation systems	$71,523,780
Acreage irrigated	7,821,190
Year's value of irrigated crops	$99,624,148

THE PIVOTAL FIELD—THE CENTRE OF THE UNITED STATES, EAST AND WEST

Alfalfa ready for the third cutting. The first and second cuttings are in the stocks

The growth of our exports of raw cotton, in quantities, deserves special record, as indicating the great growth in production of the "great American staple."

DECADE YEARS	Pounds
1830	298,459,102
1840	743,941,061
1850	1,026,602,269
1860	1,767,686,338
1870	958,558,523
1880	1,822,061,114
1890	2,471,799,853
1900	3,100,583,188
1901	3,330,890,448
1902	3,500,778,763
1903	3,543,043,022

The rapid recovery in 1870–1880, after the devastation of 1861–5, demonstrated the wonderful recuperative powers of the American nation.

RANK OF STATES AND TERRITORIES IN AGRICULTURE. CENSUS OF 1900.

STATE	Yearly product	Rank
Iowa	$365,411,528	1
Illinois	345,649,611	2
Ohio	257,065,826	3
New York	245,270,600	4
Texas	239,823,244	5
Missouri	219,296,970	6
Kansas	209,895,542	7
Pennsylvania	207,895,600	8
Indiana	204,450,196	9
Nebraska	162,696,386	10
Minnesota	161,217,304	11
Wisconsin	157,445,713	12
Michigan	146,547,681	13
California	131,699,606	14
Kentucky	123,266,785	15
Tennessee	106,166,440	16
Georgia	104,304,476	17
Mississippi	102,492,283	18
Alabama	91,387,409	19
North Carolina	89,309,638	20
Virginia	86,548,545	21
Arkansas	79,649,490	22
Louisiana	72,667,302	23
South Carolina	68,266,912	24
South Dakota	66,082,419	25
North Dakota	64,252,494	26
Oklahoma	45,447,744	27
West Virginia	44,768,979	28
Maryland	43,823,419	29
New Jersey	43,657,529	30
Massachusetts	42,298,274	31
Oregon	38,090,969	32
Maine	37,113,469	33
Washington	34,827,495	34
Vermont	33,579,892	35
Colorado	33,048,576	36
Montana	28,616,957	37
Connecticut	28,276,948	38
Indian Territory	27,672,002	39
Hawaii	22,040,731	40
New Hampshire	21,929,988	41
Florida	18,309,104	42
Idaho	18,051,625	43
Utah	16,502,051	44
Wyoming	11,907,415	45
New Mexico	10,155,215	46
Delaware	9,290,777	47
Arizona	6,997,097	48
Nevada	6,758,337	49
Rhode Island	6,333,864	50
District of Columbia	870,247	51
Alaska	8,048	52

With the Philippines and Porto Rico to hear from in the census of 1910.

In his annual report for 1903, Secretary of Agriculture Wilson says: "The value of all farm products not fed to live stock for 1903 considerably exceeded their value in the census crop year, 1899, when it was $3,742,000,000." Reports from various sources, though not complete, indicate a crop value in 1903, of nearly $5,000,000,000.

Such is the proud position which the American farmer occupies in the world to-day. His products find a place on nearly all the tables of the nations. His flour feeds the Orient. His corn goes to every corner of the globe, while at home he feeds and energizes 82,000,000 fellow-Americans.

Manufactures.— The busy factory is an attractive subject. As a rule, the busy workman is a valuable citizen. As the people are, so is the nation. A working people is a working nation, and a working nation is a progressive nation. Under the head of manufactures the census of 1900 gives us the following:

Number of establishments	512,276
Capital	$9,831,486,500
Officials, clerks, etc	397,092
Yearly salaries of same	$404,112,794
Wage-earners, average	5,314,539
Yearly wages of same	$2,327,295,495
Miscellaneous expenses	$1,027,865,277
Cost of materials used	$7,346,358,979
Value of products, yearly	$13,010,036,514
In addition there were:	
Establishments producing less than $500 yearly	127,346
Capital	$44,371,111
Proprietors	136,054
Wage-earners	64,761
Yearly wages	$2,117,466
Miscellaneous expenses	$2,524,681
Cost of materials used	8,895,774
Value of product, yearly	$29,762,675
Besides,	
Governmental establishments	138
Materials used in same	$6,917,518
Yearly product of same	$22,010,391
Education, eleemosynary, and penal institutions	381
Materials used in same	$3,690,916
Yearly product of same	$6,640,692
Giving us a grand total of:	
Establishments	640,056
Capital	$9,858,205,501
Proprietors and firm members	708,623
Wage-earners, average	5,370,814
Yearly wages	$2,323,055,634
Miscellaneous expenses	$1,030,110,125
Cost of materials used	$7,363,132,083
Value of yearly product	$13,058,562,917

Those figures represent the manufacturing army of the United States, and its yearly work in 1900. Both are larger now. Dealing only with that part of this army outside of governmental and other public institutions, and also outside of all establishments, having a product of less than $500 yearly, we find the increases between 1850 and 1900, to have been:

Establishments	389,251
Capital	$9,298,241,149
Wage-earners, average	4,357,480
Yearly wages of same	$2,090,540,081
Cost of materials used	$6,791,235,157
Value of yearly product	$11,990,929,898

A stupendous record for only half a century, including ten years of disorganization. Nearly $12,000,000,000 more manufactures produced in one year. Nearly $9,300,000,000 more capital invested; nearly 4,500,000 more wage-earners; nearly $2,100,000,000 more wages disbursed in one year. No other country in the world has such a grand record. No wonder that the raw cotton consumed in American mills increased from 595,000 bales in 1850 to 3,644,000 bales in 1900. No wonder that the imports of raw silk increased from 583,589 pounds in 1870 to 13,043,714 pounds in 1900. No wonder that the import of crude rubber increased from 9,624,098 pounds in 1870, to 49,377,138 pounds in 1900; and so on through the list of manufacturer's materials which we do not yet produce in our own possessions.

Space will not permit the listing of the

individual products of all our industries in 1900, but the following is a list of the more important groups:

Industry	Product in 1900
Food and kindred products	$2,273,880,874
Iron and steel, and products	1,793,490,908
Textiles	1,637,484,484
Hand trades	1,183,615,478
Lumber, and re-manufactures of	1,030,695,350
Metals, and products, not iron or steel	748,795,464
Paper and printing	606,317,768
Leather and finished products	583,731,046
Chemicals, and allied products	552,797,877
Land vehicles	508,524,510
Liquors and beverages	425,504,167
Clay, glass, and stone products	293,564,235
Tobacco	283,076,546
Shipbuilding	74,578,158

The only weak point in this schedule is shipbuilding, which while showing an increase of $57,000,000 capital since 1880, can record only $38,000,000 increased product. A capital of $77,000,000 in building ships, producing only $74,000,000 product a year, is decidedly not satisfactory.

The capital employed in these groups is:

Industry	Capital
Iron and steel, and products	$1,528,979,076
Textiles	1,366,604,058
Lumber, and its re-manufactures	945,934,565
Food and kindred products	937,686,610
Paper and printing	557,610,837
Liquors and beverages	534,101,049
Chemicals, and allied products	498,282,219
Metals, other than iron and steel	410,646,057
Land vehicles	396,671,441
Hand trades	392,442,255
Clay, glass, and stone products	350,902,367
Leather, and finished products	343,600,513
Tobacco	124,089,871
Shipbuilding	77,362,701

The ownership of the 512,191 manufacturing establishments embraced in the foregoing summaries, classifies as follows:

Owned by	Number	Value of yearly product
Individuals	372,692	$2,674,426,373
Partnerships	96,701	2,565,242,473
Corporations	40,705	7,729,520,548
Co-operative and miscellaneous	2,093	30,959,765

Industrial combinations represent:

Number of combinations	185
Number of plants	2,040
Capital	$1,436,625,910
Wage-earners, average	400,046
Yearly wages	$195,122,980
Miscellaneous expenses	$152,157,700
Cost of materials used	$1,089,666,334
Value of yearly product	$1,667,350,949

The United States Steel Corporation — the largest single corporation in the world — was not in existence when the census of 1900 was taken, or these figures would be doubled.

By States and Territories of the Union, the 512,276 manufacturing establishments list in number, capital, and yearly product as follows, in order of product:

State	Number	Capital	Yearly product
New York	78,658	$1,651,210,220	$2,175,726,900
Pennsylvania	52,185	1,551,548,712	1,834,790,860
Illinois	38,360	776,829,598	1,259,730,168
Massachusetts	29,180	823,264,287	1,035,198,980
Ohio	32,398	605,792,666	832,438,113
New Jersey	15,481	502,824,082	611,748,933
Missouri	18,754	249,888,581	385,492,784
Indiana	18,015	234,481,528	378,120,140
Wisconsin	16,187	330,568,779	360,818,942
Michigan	16,807	284,097,133	356,944,082
Connecticut	9,128	314,696,736	352,824,106
California	12,582	205,395,025	302,874,761
Minnesota	11,114	165,832,246	262,655,881
Maryland	9,879	163,147,260	242,552,900
Rhode Island	4,189	183,784,587	184,074,378
Kansas	7,830	$66,827,262	$172,129,398
Iowa	14,819	102,733,103	164,617,877
Nebraska	5,414	71,982,127	143,990,102
Kentucky	9,560	104,070,791	154,166,365
Virginia	8,248	103,670,988	132,172,910
Maine	6,702	122,918,826	127,361,485
Louisiana	4,350	113,084,294	121,181,683
Texas	12,289	90,433,882	119,414,982
N. Hampshire	4,671	100,929,661	118,709,308
Tennessee	8,016	71,814,038	108,144,565
Georgia	7,504	89,789,656	106,654,527
Colorado	3,570	62,825,472	102,830,137
N. Carolina	7,226	76,503,894	94,919,663
Washington	3,631	52,649,760	86,795,051
Alabama	5,602	70,370,081	80,741,449
West Virginia	4,418	55,904,238	74,838,330
S. Carolina	3,762	67,356,465	58,748,731
Vermont	4,071	48,547,964	57,623,815
Montana	1,080	40,945,846	57,075,824
Dist. of Col'b.	2,754	41,981,245	47,667,622
Oregon	3,088	33,422,393	46,000,587
Arkansas	4,794	35,960,640	45,197,731
Delaware	1,417	41,203,239	45,387,630
Mississippi	4,772	35,807,419	40,431,386
Florida	2,056	33,107,477	36,810,243
Hawaii	395	11,541,655	24,992,068
Arizona	314	10,157,408	21,315,189
Utah	1,400	14,650,948	21,156,183
South Dakota	1,639	7,578,895	12,231,239
North Dakota	1,130	5,396,490	9,183,114
Oklahoma	870	3,352,064	7,083,938
New Mexico	420	2,698,786	5,605,795
Wyoming	334	2,411,435	4,301,240
Alaska	63	3,600,409	4,250,984
Idaho	591	2,941,524	4,020,532
Indian Ter.	789	2,624,265	3,892,181
Nevada	228	1,472,784	1,643,675

Attention is drawn to the particularly good showing made by our young territories. The Philippine Islands and Porto Rico figures would add considerably to this list but are not yet statistically available. Manila alone has over 2,000 manufacturing establishments, some of them — the cigar factories — being quite large.

It is estimated that now (1904) we have 600,000 manufacturing establishments, with 7,000,000 wage-earners, and a yearly product of $14,500,000,000.

In the most important industries, the States contributing the preponderating shares of the entire manufacture, are as follows:

Industry	State	Per cent of entire manufacture
Iron and steel	Pennsylvania	54.0
Meat packing	Illinois	41.5
Cotton goods	Massachusetts	32.8
Boots and shoes, factory product	Massachusetts	44.9
Leather	Pennsylvania	27.3
Paper and wood pulp	New York	21.0
Silk and silk goods	New Jersey	37.3
Agricultural implements	Illinois	41.5
Liquors, distilled	Illinois	39.5
Hosiery and knit goods	New York	37.6
Glass	Pennsylvania	38.9
Carpets and rugs	Pennsylvania	48.0
Jewelery	Rhode Island	28.6
Pottery and clay products	Ohio	26.8
Fur hats	Connecticut	27.2
Turpentine and rosin	Georgia	39.9
Brassware	Connecticut	54.1
Leather gloves	New York	64.9
Collars and cuffs	New York	99.6
Corsets	Connecticut	46.0
Cotton, ginning	Texas	39.9
Platedware	Connecticut	75.7
Silverware	Rhode Island	36.3
Salt	New York	33.9
Clocks	Connecticut	63.5
Liquors, vinous	California	60.1
Safes and vaults	Ohio	61.3
Oysters, canning	Maryland	65.9
Whips	Massachusetts	60.4

The following cities led in the manufacture of the lines specified to the extent of the percentages named:

1. Eli Whitney. 2. Cyrus H. McCormick. 3. Robert Fulton. 4. Elias Howe.
5. S. F. B. Morse. 6. Thomas A. Edison.

City	Article	Per cent of total
Troy, N. Y.	Collars and cuffs	85.3
Baltimore, Md.	Oysters	64.4
Schenectady, N. Y.	Electrical apparatus	53.0
Connellsville, Pa.	Coke	48.1
Waterbury, Conn.	Brassware	47.8
Philadelphia, Pa.	Carpets and rugs	45.6
Gloversville, N. Y.	Gloves	38.8
Providence, R. I.	Silverware	36.3
Chicago, Ill.	Meat packing	35.6
Meriden, Conn.	Plated ware	32.8
Providence, R. I.	Jewelry	27.4
Chicago, Ill.	Agricultural implements	24.5
Paterson, N. J.	Silk and silk goods	24.2
St. Louis, Mo.	Tobacco (not cigars)	22.7
Bridgeport, Conn.	Corsets	21.7
Lawrence, Mass.	Worsted goods	20.5
Danbury, Conn.	Fur hats	18.0
Philadelphia, Pa.	Woolen goods	15.5
Baltimore, Md.	Fruits and vegetables	15.0
Philadelphia, Pa.	Hosiery and knit goods	13.7
Pittsburg, Pa.	Iron and steel	11.3
Trenton, N. J.	Pottery and clay products	10.8
Philadelphia, Pa.	Leather	8.9
Fall River, Mass.	Cotton goods	8.6
Brockton, Mass.	Boots and shoes	7.6
Pittsburg, Pa.	Glass	4.3

By principal cities the census of 1900 record of our manufacturing industries is, in the order of capital of $10,000,000, or over:

City	Number	Capital	Yearly product
New York, N. Y.	39,776	$921,876,081	$1,371,358,468
Chicago, Ill.	19,203	534,000,689	888,945,311
Philadelphia, Pa.	15,887	476,529,047	603,466,526
Pittsburg, Pa.	1,938	193,162,900	203,261,251
St. Louis, Mo.	6,732	162,179,331	233,629,733
Boston, Mass.	7,247	143,311,376	206,081,767
Baltimore, Md.	6,359	117,062,459	161,249,240
Milwaukee, Wis.	3,342	110,363,854	123,786,449
Cincinnati, Ohio	5,127	109,582,142	157,806,834
Buffalo, N. Y.	3,902	103,939,655	122,230,061
Newark, N. J.	3,339	103,191,403	126,954,049
Cleveland, Ohio	2,927	98,303,682	139,849,806
Providence, R. I.	1,933	83,573,679	88,168,897
Jersey City, N. J.	965	80,327,678	77,225,116
San Francisco, Cal.	4,002	80,103,367	133,069,416
Detroit, Mich.	2,847	71,751,193	100,892,838
Schenectady, N. Y., est.	300	65,000,000	50,000,000
Fall River, Mass.	785	58,549,934	43,071,530
Minneapolis, Minn.	2,368	57,708,204	110,943,043
Allegheny, Pa.	893	50,122,503	54,136,967
Louisville, Ky.	2,307	49,334,701	78,746,390
Rochester, N. Y.	2,616	49,086,212	69,129,820
Lowell, Mass.	981	46,578,193	44,774,525
New Orleans, La.	1,524	46,003,604	63,514,505
Lawrence, Mass.	546	49,914,035	44,703,278
Paterson, N. J.	995	43,510,481	52,287,975
Worcester, Mass.	1,071	42,966,743	53,348,783
Washington, D. C.	2,754	41,981,245	47,667,622
Indianapolis, Ind.	1,910	36,828,114	68,607,579
Omaha, Neb.	838	34,478,014	43,168,876
Bridgeport, Conn.	832	33,066,890	37,883,721
Syracuse, N. Y.	1,383	31,358,055	31,948,055
Denver, Col.	1,474	30,883,406	41,368,698
Hartford, Conn.	888	30,500,047	31,145,715
New Haven, Conn.	1,236	30,463,066	40,762,015
New Bedford, Mass.	618	29,073,410	25,681,671
St. Paul, Minn.	1,591	28,208,389	38,541,030
Wilmington, Del.	759	28,372,043	34,053,324
Dayton, Ohio	1,096	28,027,518	35,697,695
Peoria, Ill.	871	27,971,613	48,871,596
Reading, Pa.	843	27,975,628	36,902,511
Holyoke, Mass.	433	26,760,031	26,283,964
Cambridge, Mass.	782	26,662,751	39,162,013
Bayonne, N. J.	225	26,583,058	39,352,248
Kansas City, Mo.	1,797	26,437,307	36,527,392
Trenton, N. J.	570	26,174,895	31,645,695
Columbus, Ohio	914	25,302,136	39,666,848
Toledo, Ohio	1,050	25,591,916	37,372,355
Akron, Ohio	431	24,199,310	23,610,099
Troy, N. Y.	662	23,531,622	28,200,259
Waterbury, Conn.	404	23,421,640	33,778,905
Grand Rapids, Mich.	824	23,433,760	24,824,042
Passaic, N. J.	185	23,279,421	14,031,254
Manchester, N. H.	577	22,426,125	26,607,600
Pawtucket, R. I.	534	22,399,187	24,080,328
Youngstown, Ohio	260	22,360,097	34,801,101
Albany, N. Y.	1,566	21,328,764	24,992,021
Richmond, Va.	763	20,848,620	28,000,616
Erie, Pa.	644	20,418,016	19,053,202
Scranton, Pa.	710	19,954,525	27,646,418
Utica, N. Y.	733	19,289,502	19,550,850
Kansas City, Kansas.	492	18,633,475	82,768,943
Chester, Pa.	315	$18,977,710	$16,421,725
South Bend, Ind.	302	18,156,638	14,236,331
Wilmerding, Pa.	10	19,546,543	9,171,384
McKeesport, Pa.	180	17,876,016	37,074,136
Niagara Falls, N. Y.	265	14,821,819	9,909,228
Springfield, Mass.	817	17,105,947	21,207,039
Lynn, Mass.	776	17,011,761	41,633,845
Johnstown, Pa.	248	16,940,450	22,559,890
Racine, Wis.	252	16,753,215	12,502,796
Meriden, Conn.	260	16,699,004	13,485,040
South Omaha, Neb.	139	16,471,329	70,080,041
Camden, N. J.	817	16,430,611	20,451,874
Atlanta, Ga.	390	16,045,156	16,707,027
Elizabeth, N. J.	419	15,665,545	20,546,468
Joliet, Ill.	455	15,452,196	27,765,104
Newport News, Va.	123	14,999,735	6,976,670
Woonsocket, R. I.	242	14,279,361	15,627,539
North Adams, Mass.	231	14,563,492	11,682,683
Duquesne, Pa.	19	14,358,059	20,365,667
Rockford, Ill.	450	14,126,834	12,586,116
New Britain, Conn.	226	14,115,610	12,260,782
Springfield, Ohio	305	14,091,175	12,777,173
McKees Rocks, Pa.	34	14,990,471	4,288,935
Portland, Oregon	1,064	13,331,500	23,451,132
New Castle, Pa.	216	13,308,220	21,046,842
Wheeling, W. Va.	406	13,224,577	16,747,544
Nashville, Tenn.	489	13,173,422	18,469,823
Yonkers, N. Y.	387	13,097,205	19,580,324
Fitchburg, Mass.	308	13,033,898	14,253,522
Auburn, N. Y.	316	12,810,363	10,591,109
Whiting, Ind.	6	12,701,598	16,674,285
Hamilton, Ohio	222	12,575,821	12,003,316
Charleston, S. C.	364	12,473,187	9,562,387
Pueblo, Col.	241	12,374,248	30,795,481
Allentown, Pa.	491	11,996,971	16,947,722
Los Angeles, Cal.	1,415	11,742,838	21,297,537
Taunton, Mass.	284	11,737,399	12,594,814
Cohoes, N. Y.	316	11,316,482	11,636,130
Memphis, Tenn.	659	11,189,249	17,923,059
Moline, Ill.	157	11,165,701	10,000,282
St. Joseph, Mo.	440	11,068,825	31,690,736
Lewiston, Me.	282	10,984,871	8,581,354
Davenport, Ia.	416	10,774,707	11,573,670
Wilkesbarre, Pa.	438	10,501,537	10,758,348
East St. Louis, Ill.	183	10,466,412	33,559,611
Lancaster, Pa.	738	10,803,464	16,370,281
Seattle, Wash.	953	10,131,651	26,373,402
Somerville, Mass.	378	10,131,596	21,776,511
Amsterdam, N. Y.	213	10,119,879	11,502,316
Brocton, Mass.	428	10,193,688	26,384,881
Canton, Ohio	502	10,094,813	12,258,427
Evansville, Ind.	705	10,059,375	14,193,320

The striking feature about this tabulation is the large manufacturing interests in the West and Far West, and the comparatively larger yearly outputs. The factory creates demand for the farmer's output and energizes every line of home industry.

Mining.— Though the details of the mineral production of the United States in 1902 calendar year are not yet available it is known that the total exceeds $1,260,000,000, the largest on record. The 1901 report of the United States Geological Survey gives the total for that calendar year as $1,086,529,521, made up as follows:

Product	Quantity	Value
Metallic		
Pig iron, spot value, long tons	15,878,354	$242,174,000
Silver, coining value, troy ounces	55,214,000	71,387,800
Gold, coining value, troy ounces	3,805,500	78,666,700
Copper, value in New York, pounds	602,072,519	87,300,515
Lead, value in New York, short tons	270,700	23,280,200
Zinc, value in New York, short tons	140,822	11,265,760
Quicksilver, San Francisco value, flasks	29,727	1,382,305
Aluminum, Pittsburg value, pounds	7,150,000	2,238,000
Antimony, San Francisco value, short tons	2,649	542,020
Nickel, Philadelphia value, pounds	6,700	3,551
Tin	none	
Platinum, San Francisco value, troy ounces	1,408	27,526
Total value of metallic products		$518,268,377

Product	Quantity	Value
Non-metallic, spot values.		
Bituminous coal, short tons	225,826,849	$236,406,449
Pennsylvania anthracite, long tons	60,242,560	112,504,020
Petroleum, barrels	69,389,194	66,417,335
Stone		55,615,926
Natural gas		27,067,500
Cement, barrels	20,068,737	15,786,789
Brick clay		13,800,000
Mineral waters, gallons sold	55,771,188	7,586,962
Salt, barrels	20,566,661	6,617,449
Phosphate rock, long tons	1,483,723	5,316,403
Limestone for iron flux, long tons	8,540,168	4,659,836
Zinc white, short tons	46,500	3,720,000
Clay, all other than brick		2,576,932
Gypsum, short tons	659,659	1,577,493
Pyrites, long tons	234,825	1,024,449
Borax, short tons	23,221	1,011,118
Mineral paints, pounds	61,460	789,962
Grindstones		580,703
Asphaltum, short tons	63,134	555,335
Fibrous talc, short tons	69,200	483,600
Soapstone, short tons	28,643	424,888
Precious stones		289,050
Sulphur, short tons	7,690	223,430
Feldspar, short tons	34,741	220,422
Graphite		167,714
Oilstones, etc.		158,300
Garnet for abrasive purposes, short tons	4,444	158,100
Barytes, crude, short tons	49,070	157,844
Bromine, pounds	552,043	154,572
Flint, short tons	34,420	149,297
Corundum and emery, short tons	4,305	146,040
Marls, short tons	99,880	124,880
Manganese ore, short tons	11,995	116,722
Fluorspar, short tons	19,586	113,803
Mica, sheets, pounds	360,060	98,859
Mica, scrap, short tons	2,171	19,719
Fuller's earth, short tons	14,112	96,835
Bauxite, long tons	18,905	79,914
Monazite, pounds	748,736	59,262
Millstones		57,179
Infusorial earth and tripoli, short tons	4,020	52,950
Magnesite, short tons	13,172	43,057
Cobalt oxide, pounds	13,360	24,048
Asbestos, short tons	747	13,498
Chromic iron ore, long tons	368	5,790
Rutile, pounds	44,250	5,710
Total value non-metallic mineral products		$567,261,144

SUMMARY — 1901, CALENDAR YEAR.

Value of metallic mineral products	$518,268,377
Value of non-metallic mineral products	567,261,144
Estimated value unspecified mineral products	1,000,000
Grand total value all mineral products	$1,086,529,521

The following is sufficient to give an idea of our growth in production of minerals and their resultants:

Gold — From $2,463 in 1810, to $79,171,000 in 1900.
Silver — From $50,000 in 1850, to $74,533,000 in 1900.
Petroleum — From 21,000,000 gallons in 1860, to 2,661,000,000 gallons in 1900.
Pig iron — From 20,000 tons in 1820, to 13,789,000 tons in 1900.
Steel — From 68,750 tons in 1870, to 10,188,000 tons in 1900.
Copper — From 100 tons in 1840, to 270,588 tons in 1900.

Total mineral production, 1902	$1,260,000,000
Less 1894 production	527,000,000
Gain in 1902 over 1894	$ 733,000,000

In other words, this $733,000,000 gain in 1902 in mineral production paid the $506,000,000 ordinary expenditures of the government in 1903 fiscal year, and $227,000,000 over.

Pig iron particularly, shows remarkable increases. The figures for three years are:

Year	Long tons
1899	13,620,703 (record year)
1900	13,789,242
1901	15,878,354

This is an increased production in one year of 2,089,112 long tons, or 15.15 per cent.

In iron ores the figures are:

Year	Long tons
1901	28,887,479
1900	27,533,161
Gain, one year	1,334,318 long tons, or 5%

In 1900 the gain over 1899 was 12 per cent. As in 1898, 1899, and 1900, the production of iron ores in 1901, has never been equaled by any other country. The nearest was Germany, 18,664,772 long tons in 1900. This was about 10,000,000 long tons short of our production. "Our coal production in 1901 was nearly 75 per cent larger than that of Germany, nearly 7 times that of Austria-Hungary, and more than 8 times that of France," says Mr. Charles D. Walcott, Director of the U. S. Geological Survey, in his 1901 report now under reference. Attention is drawn to the enormous sale in 1901 of American mineral waters — 55,771,188 gallons (8,000,000 more than in 1900), of the value of $7,586,962, an increase in value of $1,341,790. Twenty-five States and one Territory mined iron ore in 1901, with a total production of 28,887,479 long tons, against 11,879,679 long tons in 1894, an increase of 17,007,800 long tons in 1901. This is why we imported in 1901, only 966,950 long tons of special quality iron ore. Most of this 526,583 long tons came from Cuba. Our export of iron ores was 64,703 long tons, which went to Canada for mixing purposes. Colorado led in gold production, $27,693,500, and also in silver production, $18,437,800. The Cripple Creek, Colorado district alone has produced $94,536,451 in gold in the ten years 1891–1901, beginning with $2,000 in 1891, and closing with $17,261,579 in 1901. In cement we have a fine record. Its production in 1901 was 12,711,225 barrels, an increase of 4,229,205 barrels, or 50 per cent over the production of 1900. The value of 1901 production was $12,532,360. Pennsylvania led with 7,091,500 barrels, value, $6,382,350. In phosphate rock our record of production is also good, beginning with 211,377 long tons worth $1,123,823 in 1880, and closing with 1,483,723 long tons, valued at $5,316,403, in 1901. Florida leads with half the production.

From 182,995 short tons in 1890 to 659,659 short tons in 1901, is our remarkably good record in the production of gypsum.

Of our enormous mineral production in 1901, $1,086,000,000, we exported only $39,000,000 worth; therefore, the remaining $1,047,000,000 worth was used either in profitable home consumption, or added to our stock of national assets. This represents additional national wealth, for one year's work in mining, equal to $12 per head for each man, woman, and child in the country. This is a result never before equaled by any country in the world. At the same time, it is known that in our continental area and our newly-acquired non-contiguous territories, there exists a store of mineral wealth, the value of which is beyond even the most imaginative calculation. Besides this stored-up wealth — this vast treasury of the future — the total value of all our mineral production since the first day of our national existence, 128 years ago, sinks into insignifi-

cance. Yet the United States is to-day, in its developed wealth, the richest nation on the face of the globe.

Forest Products.— Complete data of the total products of our forests not being available, and the fact that a good share thereof is included under the head of manufactures, renders it impossible to make a proper showing of this important one of our material industries. Still we can form some idea of the total production from the almost unlimited use of wood manufactures which we see on every hand; also from the following record of limited, though increasing exports.

Year	Exported
1800	$2,228,863
1820	3,822,785
1840	3,868,694
1860	10,299,959
1880	17,321,268
1900	54,317,294
1903	57,835,896

Fisheries.— As in the case of forest products, so in the case of our fisheries industry, the writer is not in possession of production data. The export record is:

Year	Export
1800	$1,098,511
1820	2,251,000
1840	3,198,370
1860	4,156,480
1880	5,255,402
1900	6,326,620
1903	7,805,538

Miscellaneous.— Under this production head, data, if available, would be extremely tedious, embracing so many small items. Exports classed as miscellaneous increased from $429,240 in 1800 to $6,429,588 in 1903.

Conclusion.— The gist of the whole story of the successful progress of the United States in its material industries is shown in the following summary of the financial and fiscal condition of our country at the close of business on 30 June 1903, the end of our last completed fiscal year.

Area, square miles, Continental United States	3,025,000
Population Continental United States	83,000,000
Estimated national wealth	$100,000,000,000
Public debt, less cash in treasury	$925,011,637
Annual interest charge	$25,541,573
Gold coined, 1903	$43,683,971
Silver coined, 1903	$19,874,440
Money in circulation	$2,367,692,169
National banks	4,939
National banks, capital	$743,506,048
National banks, individual deposits	$3,200,993,509
Savings-banks, deposits	$2,935,204,845
State banks, deposits	$1,814,570,163
Trust companies, deposits	$1,589,398,796
Private banks, deposits	$133,217,990
Total on deposit	$9,673,385,303
Depositors in savings-banks (A sure barometer.)	7,305,228
1903, government receipts, ordinary	$596,396,674
1903, government expenditure, ordinary	$477,542,658
1903, pension payments	$138,425,646
1903, total exports	$1,420,141,679
1903, total imports	$1,025,719,237
1903, agricultural products exported	$873,322,882
1903, manufactures exported	$407,526,159
1903, mining products exported	$39,311,239
1903, forest products exported	$57,835,896
1903, fisheries products exported	$7,805,538
1903, miscellaneous products exported	$6,429,588
1903, value farm products, at least	$4,500,000,000
1903, value of farm property, at least	$21,000,000,000
1903, value of manufactures	$14,500,000,000
1902, railroad passengers carried, not trolleys	655,130,236
1902, freight carried one mile	156,624,166,021
1903, Sault St. Marie canal tonnage	27,736,444
Post-offices	74,169
1903, post-office receipts	$134,224,443
1903, telegrams sent	91,391,443
Newspapers and periodicals running	20,485
Public school pupils (1902)	15,925,887
Yearly salaries school teachers (1902)	$150,013,734
Total yearly school expenditure (1902)	$235,208,465
1903, patents issued	31,699
1903, immigrants arrived	857,046

And all this is only part of the story of American progress in material things. We have a people united in purpose, from the Gulf of Mexico to the Arctic Ocean, and from the Atlantic to the Pacific; with resources so unbounded, that, like the widow's cruse of oil they increase with the use; with a system of government more free than that of any other government under the sun; with an internal commerce worth $22,000,000,000 each and every year, and greater than the combined foreign commerce of all the countries of the world, including our own; with over one fifth of our population attending the American public school; with insular possessions which will eventually produce practically all of the $400,000,000 worth of tropical products we now buy abroad annually; with millions upon millions of acres in the Philippines, of the most valuable woods in the world.

Walter J. Ballard,
Schenectady, N. Y.

CONTENTS

OF THE DEPARTMENT OF

HISTORY OF THE UNITED STATES.

DEPARTMENT OF
HISTORY OF THE UNITED STATES.

1. United States — General Outline History of (1776 to 1904). At the close of the French war England had no settled policy of colonial administration, nor could there be said to be a definite understanding as to the constitutional relationship of the colonies to the mother-country. She entered upon plans which brought before long the loss of her dominions in America. Her ministers, anxious for funds, determined that America should make some contribution to the expense of colonial protection, and moreover that the navigation laws and acts of trade should be enforced. These acts had been systematically broken for decades, and stringent efforts to enforce them could mean nothing less than a violent interference with New England traffic. Moreover the colonies had without intermission taxed themselves and passed laws in their own legislatures. When the Stamp Act (q.v.) of 1765 was passed, a storm of protest arose from the colonists, who declared that taxation without representation is tyranny. The Parliamentary orators, on the other hand, asserted that Parliament had a right to tax the colonies, that taxation was only a part of the sovereign power, and that all legislative authority resided in the English government. The repeal of the Stamp Act was coupled with a declaration of the supreme authority of Parliament, and to the principle of this declaration the American leaders were never willing to accede. The imposition of import duties in 1767 met also with strenuous opposition in America, and when three years later all duties were abandoned except the tax on tea, the concession was not gratefully received by the colonists. Meanwhile troops had been sent to Boston, and an encounter between a detachment of the soldiers and a few citizens ended in bloodshed (1770). The Boston Tea Party (q.v.) of the year 1773 was evidence that the device of a low duty would not tempt the New-Englanders to give up their principles. The ministry now entered more seriously on efforts at coercion and passed a series of acts, the most grievous of which was the Boston Port Bill, which it was hoped would have the effect of bringing the colonists to a due respect for imperial power; but, instead of improving, conditions grew worse. In September 1774, the first Continental Congress met at Philadelphia and issued a declaration of rights and other papers. The advanced American leaders, admitting that all were subjects of a common king, were now unwilling to acknowledge the authority of Parliament in any respect; although others, denying the right to tax, were still ready to argue that the British legislature could manage commerce and external affairs. The petition of the colonists was of no avail, and the Revolution passed from the stage of controversy to that of war.

The war of the Revolution falls into three periods. Between 19 April 1775, the date of Concord and Lexington, and 4 July 1776, the revolting colonists were gradually brought by events and arguments to the notion of independence. The efforts of the British were as yet directed mainly to the repression of the uprising in Massachusetts. On 17 June 1775, Bunker Hill was fought. During the preceding month the second Continental Congress had convened at Philadelphia and bestowed the command of the American forces upon Washington. In March 1776, Howe evacuated Boston. On 7 June Richard Henry Lee of Virginia moved a resolution in Congress declaring the independence of the colonies. The adoption of this resolution 2 July, and of the Declaration of 4 July gave the Revolution a new character. It was now a war for independence and not for rights as colonists or Englishmen. Indeed the discussion had already advanced to a stage in which the Americans, though ostensibly demanding rights known to the law, were in reality asserting fundamental principles and seeking to obtain their recognition in the law of the land; they were working for the legal formulation of a democratic doctrine. Of this doctrine the Declaration is an embodiment, as were some of the State constitutions which the people were now constructing. The most important proposition was that people exist before government and are possessed of natural rights which are inalienable, and which governments, the work of their hands, cannot rightfully take away.

The second period of the Revolution, beginning with the Declaration, ends with the entrance of France into the war. During this period it was the endeavor of the British to separate Massachusetts and Virginia by gaining control of the Champlain-Hudson valley. The battle of Long Island, August 1776, left New York in the hands of the British, and a year later Washington, defeated at Brandywine, was forced to yield Philadelphia to Howe. But in the meantime, Burgoyne, who had been sent from Canada to effect the main object of the British campaign, had been getting into difficulty, and on 17 Oct. 1777, he was forced to surrender to Gates at Saratoga. This victory probably determined the result of the war. France, who had hitherto contented herself with secretly aiding the Americans, in February 1778 entered into a treaty of alliance with them, hoping to secure thereby the enfeeblement of her ancient enemy, England.

The United States could hardly have achieved their independence without the French alliance. France was able to furnish the sea power without which it is highly improbable that Yorktown could have been won. On the other hand, there is evidence that England entered into the contest with new zeal, now that she was confronted by her old enemy, France; and after the French alliance the Americans were more than once grievously near defeat.

The third period of the war ends with the signature of the treaty of peace at Paris, 3 Sept. 1783. Aside from Arnold's treason, interest in this period is confined to the south. Here the Loyalists were strong, and the British hoped to

save at least Georgia and the Carolinas. In 1778 Savannah was captured and Georgia was overrun by the British. In 1780 Charleston fell and Gates was utterly defeated at Camden by Cornwallis. The tide began to turn with the opening of 1781, when Greene took command in the south. Winning no victories, he nevertheless sold victory so dearly that by September Cornwallis was retiring northward, leaving the entire south, except Savannah and Charleston, in the hands of the patriots. Cornwallis entered Yorktown, Va., and was there besieged by the French fleet under De Grasse and the American and French armies under Washington and Rochambeau. He surrendered 19 Oct. 1781.

In the peace negotiations at Paris, which filled the year 1782, the United States was represented by Franklin, who had been in France since 1777, Jay, and John Adams. They succeeded in making a favorable treaty. The western boundary of the States was set at the Mississippi, and their southern at the 31st parallel as far as the Appalachicola River, from which point it proceeded along the present north boundary of Florida to the Atlantic. The area of the territory lying within these boundaries was 827,844 square miles. Before the war was over the States had adopted Articles of Confederation and Perpetual Union (1 March 1781). These articles apparently purported to have sovereignty in the individual States; and after the war was over, the States showed lack of appreciation of continental obligations and privileges. The Congress of the Confederation, in which body all the power granted by the Articles was centered, proved ineffective, for in cases of crucial need it could do little more than implore the States for funds or solicit obedience to the orders which it had issued. There was no power in the central authority to collect taxes or regulate commerce. Things went from bad to worse — the States eyeing each other in jealous scrutiny; the debt of the Confederation growing larger, while the States, themselves distressed, refused to furnish the needed money; England refusing with some cause to surrender the western ports within our territory; Spain refusing to acknowledge our right to navigate the lower Mississippi. Washington wrote, "Something must be done or the fabric will fall, for it certainly is tottering." One great bond of union, one fact of national significance needs, however, to be mentioned. By 1786 the States that claimed land east of the Mississippi, north of the Ohio, and west of Pennsylvania had surrendered their claims, Connecticut still retaining a small portion which was long known as the Western Reserve. For the organization of this domain, Congress passed the Ordinance of 1787, one of the great state papers of American history; it provided for temporary governments, for the final admission of the Territories as States, and for the permanent exclusion of slavery.

In May 1787, a convention of delegates met at Philadelphia, charged with the duty of rendering "the Federal Constitution adequate to the exigencies of the Union." The work lasted four months. Its product was the Constitution of the United States. As to whether the convention should disregard instructions and proceed to draw up a new constitution instead of altering the Confederation, there was much discussion, tinged frequently with acrimony. The "large-state party" insisted on a government with authority and on proportional representation. The "small-state party," some of whom were not averse to a national government, yet feared for their States, and, in jealousy of their stronger neighbors, advocated equal representation of the States. The outcome was compromise: the legislature of each State was to have the right to elect two members of one branch of the national legislature, while the principle of proportional representation was to obtain as a basis for the other house. The Constitution, abandoning the old principle of the Confederation, provided for a government immediately over individuals; it provided for a system whereby every citizen would be subject to two governments. The powers delegated to the new government were enumerated powers, and the field of political activity was thus divided between the central government on the one hand and the State on the other. The Constitution provided for executive, judicial, and legislative departments and applied the principle of separation of the powers. The instrument thus prepared was passed on by conventions in the States. The struggle over the adoption was very sharp; but by the end of 1788 the Constitution had been ratified by all the States save Rhode Island and North Carolina. The government called for by the new Constitution was put into operation before these two States ratified. To reassure those who were fearful that the national authority would be destructive of individual liberty, the first 12 amendments to the Constitution were drawn up by the first Congress, and 10 of them were ratified by the States.

Washington was unanimously chosen the first President of the United States and took the oath of office on 30 April 1789. Congress had already assembled and begun important tasks of legislation. There was a crying need for revenue, and a tariff bill was soon passed. The government was quickly put into working order; necessary executive departments were established; a Supreme Court and inferior tribunals were founded. Washington made Thomas Jefferson Secretary of State, Alexander Hamilton Secretary of the Treasury, and Henry Knox Secretary of War. The first two represented different tendencies in American life, and about them are crystallized the two leading parties of the country; about Hamilton the Federalists, who were strong supporters of his policy, and about Jefferson the Republicans, who believed that Hamilton was intent upon establishing monarchical institutions. Not until about 1792, however, were these parties really organized, and the word organization seems hardly applicable to the political parties of a hundred years ago when compared with those of the present time. Jefferson had faith in the people and was responsive to the impulse of democratic America; Hamilton had rare talent for organization and administration, and represented the conservative forces of the time. The Federalists advocated a broad and liberal interpretation of the Constitution; the Republicans favored a strict interpretation, fearing that the Federalists would make use of their power to injure State rights or individual liberty. In the determination of the political affiliations, Hamilton's financial policy had much to do. He advocated the funding of the public debt and the assumption of

the State debts with the understanding that the creditors should be paid in full. He also proposed the establishment of a national bank and the levying of an excise tax, and raising adequate revenue by a tariff so arranged as to offer also support to American manufactures. All of these measures were adopted, and he thus brought to his support the holders of the public debt and, as a rule, the commercial and more substantial classes in the community.

The difficulties of Washington's first administration centered chiefly in domestic affairs. Soon after the beginning of his second administration war broke out between England and France, and for the next 20 years American politics and interests were much affected by European conditions. The Federalists, on the whole, sympathized with England, whereas the Republicans, having different industrial interests, were more inclined to sympathize with France. Difficulties of various kinds reached their climax in 1794, when the stability of the government was in danger. An insurrection against the whiskey tax had broken out in western Pennsylvania; the Indians had for some years been waging war in the northwest, and two armies sent to suppress them had been defeated; the English, indignant at the way in which Genet, the French minister to America, had been allowed to use our ports, were giving evidences of hostility and there was imminent danger of war. American commerce was ill-used by the British, who were not willing to see the Americans profiting by the contest between England and France. These serious difficulties were finally disposed of by prompt and discreet action on the part of Washington's government. An army sent to western Pennsylvania suppressed the insurrection; General Wayne overwhelmed the Indians at the battle of Fallen Timbers; and John Jay, despatched as a special envoy to Great Britain, succeeded in making a treaty which, for a time, reconciled the two countries and did something to allay the ill-feeling that had been near bringing on open war. When Washington's second administration ended, the government was well founded; there were strong evidences of national patriotism and, despite the high degree of partisan bitterness, there was no reasonable ground for fear that the country would relapse into the state of confusion such as existed eight years before.

John Adams was the second President of the United States. He inherited, as his chief trouble, the French dissatisfaction with the Jay treaty and with the way in which the United States had received France's claims to special consideration. The French, too, were not considerate in their treatment of American commerce. Adams, hoping to arrange affairs amicably, sent a commission to Paris with authority to treat. This commission was treated with contumely by the Frenchmen and was given to understand by messengers sent from Talleyrand that America must furnish money and offer bribes if she would have her interests considered. When this story was told in the United States, the people were righteously indignant; an army was organized, Washington was put at the head of the troops, hostile engagements actually occurred between ships of the two countries at sea, and it was fully expected that war would ensue. Adams, however, listening to intimations that came in a roundabout way from Talleyrand, appointed a new commission and succeeded in coming to terms with France. In the meantime the Federalists, influenced by the prevailing excitement, had passed two measures of dangerous tendency — the Sedition Act and the Alien Act, against which the Republicans, under the lead of Madison and Jefferson, strongly protested. Virginia drew up the famous Virginia resolutions of 1798 and 1799, which were the handiwork of Madison, while Kentucky presented similar resolutions, portions of which were prepared by Jefferson. These documents declared against the constitutionality of the Alien and Sedition Laws; the Virginia resolution declared that in case of a plain violation of the Constitution by the central government, the State was "in duty bound to interpose"; in the Kentucky resolutions of 1799 it was announced that "nullification" (q.v.) was the rightful remedy. To explain what was meant by these resolutions would require much more space than the present article allows, and we must content ourselves with saying that there was evident peril in resolutions which purported to put forth the opinion of a State as over against that of the national government, and moreover, that the resolutions of Virginia and Kentucky were used in later years to support a more extreme doctrine of State sovereignty, nullification, and secession.

By the original plan for choosing a President, the electors did not indicate by their votes whether they were voting for President or Vice-president; they simply voted for two persons. In 1800 Jefferson and Burr, both candidates of the same party, received an equal number of votes, and it was for some time uncertain which would be chosen President. The House of Representatives, despite the efforts of the Federalists, who voted for Burr, finally elected Jefferson, who became President on 4 March 1801. The passage of the Twelfth Amendment prevented the recurrence of this embarrassment. Jefferson's two administrations were replete with important events, full of perplexity and of difficulties. In 1803 Louisiana was purchased from France for $15,000,000, and thus America became possessed of the great region stretching from the Mississippi westward to the summit of the Rocky Mountains; and Jefferson, the leader of the party which had objected to the broad and liberal interpretation of the Constitution, did more by the acquisition of this territory to assure nationality and the continuance of broad authority in the United States, than did any other President between the foundation of the government and the election of Lincoln. The war, which was still waging in Europe and in which most of the nations of the civilized world were engaged, presented many perplexing problems to the American nation. Our merchantmen were seized on the ocean; our sailors were impressed; our cargoes were confiscated; and in general America was treated as seemed to suit the needs and the whims of England and France. The New-Englanders, on the whole, sided with England, or believed, if war must come, that a navy should be built up for American protection. The southern and western partisans of Jefferson were more inclined to sympathize with France, while the President himself, averse to war, hoped that the European combatants could be brought to their senses by some system of persuasion or peaceful coercion. The embargo

measure of 1807 had the effect, however, of injuring American commerce and threatening American merchants with ruin, but not of bringing either England or France to a proper appreciation of the neutral rights of America.

When Jefferson retired from the presidency in 1809, to be succeeded by Madison, our foreign relations were in a serious condition; and, in spite of efforts to avoid war by the enforcement of non-intercourse measures and similar expedients, hostilities finally broke out, war being declared against Great Britain in June 1812. The causes of this war need not be discussed here at length. It is sufficient to say, as we have already intimated, that both England and France had been ruthlessly disregarding the most palpable rights of the United States, and that the time seemed to have come when the new republic, though seeking peace and unprepared for war, needed to fight at least one of the European nations that had been doing us so much injury. The War of 1812 is not one which appeals to the enthusiasm, or unduly arouses the patriotism, of the American reader. The forces of the United States were not well handled, nor was there evidence of noteworthy generalship. The most famous battle was the victory of Jackson over the British at New Orleans, which in fact was fought after the treaty of peace had been signed, although of course the fact was not known on this side of the water. On the seas the American men-of-war brought credit and recognition to the nation, and doubtless the prowess shown by American captains and seamen did much to establish the United States in the eyes of the European world as a nation to be respected and to be treated with common courtesy. In fact one of our best-known historians declares that the battle between the Constitution and the Guerrière, which ended in the total destruction of the British frigate, in the course of a short half-hour raised the American nation into the position of a first-class power. And thus, though the war was not crowded with honors for American arms, and though the treaty of Ghent did not include a settlement of any of the chief difficulties which had brought the war about, the United States had done something to establish itself; there was no longer danger that American seamen would be impressed or that American commerce would be treated with ruthless disrespect. After the war was over, America entered on a long period of internal development, for the most part altogether unfretted by foreign complications. In 1817 James Monroe succeeded Madison in the presidency.

Monroe's administration (1817–25) was in some ways uneventful, but it was not for that reason the less important in American history. These years are called the "era of good feeling." As a matter of fact, there was much bitter feeling, for there was intense rivalry and personal antagonism in state and national parties. But by 1820 there was practically only one party in existence, for the opposition of the Federalists to the war, and the gradual broadening of the old Jeffersonian party had had the effect of attracting all but a few irreconcilables into the old Jeffersonian party, which was, indeed, in most respects, Jeffersonian no longer. The young and vigorous West, naturally opposed to the narrow old-time Federalism, had strengthened the Republican party and helped to give it broader and saner views of national power and duty. In 1816, forgetting their animosity to Hamilton's measures, the Republicans enacted a protective tariff law and granted a charter to the second Bank of the United States. There was in the country at large, moreover, a strong national spirit, a feeling of national strength and independence, itself in some measure the effect of the war, which for a time smothered sectional jealousy and helped to awaken patriotism. The period is also of interest to lawyers as well as to students of politics, as a time when a number of great decisions were rendered by the Supreme Court, giving, as it were, judicial confirmation to the spirit of nationalism that was otherwise manifest. John Marshall, the chief justice, with an able bench of associates, in the case of McCulloch *vs.* Maryland, decided that a State could not tax a Federal agency, and that the Federal government could establish a corporation; and the court gave expression to the doctrine of implied powers which Hamilton had enunciated 27 years before. Near the same time decisions were rendered in Martin *vs.* Hunter's Lessee, Cohens *vs.* Virginia, and the Dartmouth College case — all of great significance in constitutional history and law.

Of most importance in later days was Monroe's stand on the difficult diplomatic problem of his time, arising out of the independence of the South American states, and of the effort of European rulers, combined in the Holy Alliance, to repress popular uprisings. We acknowledged the independence of the South American states; and as long as the European powers confined their policy to the eastern hemisphere, their principles were none of our affair. There came, however, evidences of an intention to overcome the new states on this side of the ocean, and Monroe issued his famous message of 1823, announcing that we had no purpose to interfere with European affairs, but that on the other hand any attempt on the part of the European powers to extend their system to any portion of this hemisphere would be considered "as dangerous to our peace and safety."

In this "era of good feeling," characterized by nationalism as it was in the main, arose a great controversy between the free and slave States, a controversy which, as Jefferson said, "rang out like a fire bell in the night"; it foretold sectional animosity and strife. When the Constitution was adopted, slavery existed in nearly all the States, but was gradually disappearing in the North; and even in such a State as Virginia there was strong opposition on principle to the whole system. By 1820 slavery was practically extinct north of Maryland; but in the meantime, because of the invention of the cotton-gin and the development of textile machinery, slave labor had become profitable at the South and the black population had much increased. Virginia statesmen no longer cried out against the system, which was now firmly fastened not only on the Southern States of the old thirteen, but also west of the Appalachians in the rich and fertile country from the Ohio to the Gulf. The climate and soil of the Southern States were favorable to the African and to the industries based on slave labor; and the big cotton plantation became the significant feature of Southern life. At the beginning of the government almost no cotton was grown in America or

exported from its harbors; in 1824 142,400,000 pounds were sent abroad. And thus the Southern States were grounded on a system of labor at variance with the labor system of the free North, which, in its turn, had been extending over the mountain range and on to the Mississippi, filling the western land with laborers who worked with their own hands for gain. Two different industrial systems faced each other across the waters of the Ohio.

The territory of Missouri lay in the pathway of the expanding West. Slavery already existed there, but when the people asked admission to the Union, difficulties arose. The South wished to have Missouri admitted as a slave State; the North, not averse to its admission, desired to see it a free State. The South needed to have room for territorial expansion, since its agricultural system was ever demanding virgin soil and fresh acres. The North was unwilling to see a new slave State added to the Union, and many — it is difficult to say how large the number — were opposed, on principle, to the extension of slavery. The sections were now equally represented in the Senate, though the North had outstripped the South in population. In the House of Representatives the members from the free States numbered 133, while from the South, in spite of the fact that three-fifths of the slaves were counted as a basis of representation, there were only 90 members. If the South was to maintain itself politically, it needed to retain or strengthen its hold on the Senate. The contest over the admission of Missouri was long and bitter. Before it was concluded, Maine, hitherto a part of Massachusetts, sought admission, and the application at once complicated and lightened the problem. The effort to admit Missouri with a restriction providing for the gradual disappearance of slavery within its limits was not successful; and finally it was admitted as a slave State; the act providing for its admission stipulated that, excepting within the limits of the new State, slavery should not exist north of the parallel of 36° 30′, "in all that territory ceded by France to the United States under the name of Louisiana." This was the famous Missouri Compromise (q.v.). Maine was admitted, and the Senate was still evenly divided between the sections. Even more plainly than before, the Union was composed of two series of States, differing one from the other in industrial practices, in social as well as economic habits that were likely to beget misunderstandings and to develop antagonisms. There was really a division of the national domain between the two systems.

The admission of Missouri as a State, only 18 years after the vast region between the Mississippi and the mountains was purchased from Napoleon, is a proof of the remarkable growth of the United States. When the Constitution was adopted, only a few thousand people had found their way over the Appalachians; by 1810 there were over 1,000,000 inhabitants in the Mississippi basin. Kentucky, Tennessee, and Ohio had been admitted as States. At the outbreak of the War of 1812, Louisiana came into the Union, and after the war was over, in the period of industrial reorganization that ensued, thousands flocked into the western region, peopling the wilderness, clearing the forest for farms and plantations, building villages, establishing civil government. In 1816 alone 42,000 settlers entered Indiana. In six years Kentucky more than doubled her population, and Ohio was not far behind. Almost as if by magic, prosperous towns appeared where but a short time before there had been nothing but forest or empty prairie land. Before the Missouri Compromise, Mississippi, Alabama, Indiana, and Illinois had joined the Union as States. And yet this rapid peopling of the new country was but an example, extreme, perhaps, but typical nevertheless, of the movement that was characteristically American and resulted in the occupation of the great West, as far as the Pacific, in less than 100 years from the formation of the Federal government.

With this western movement came certain political acts and tendencies, not all attributable solely to Western influence, and yet intelligible only as we see the growth of the country and the development of national sentiment. Already steps had been taken for the building of a great national highway into the West. This at first the South had not opposed; even in 1816 Calhoun, moved by the national spirit of the time, in advocating the expenditure of money for internal improvements, exclaimed in the House: "Let it not . . . be forgotten — nay, let it forever be kept in mind — that our vastness exposes us at the same time to the worst of calamities, dissension. We are great and rapidly, I was about to say fearfully, growing. . . . Good roads and canals will do much to unite us." Ere long the South opposed the building of roads at national expense; but the West naturally favored making means of access to the East. Henry Clay was the strong advocate of internal improvements; and from him, too, a Western man with Western interests, came the demand for a protective tariff and the "American system." New England at first objected to the tariff as a check to its commerce; while the South was not averse to the practice. But in 1824 the northeastern States approved protection and the South opposed. Each section, North, South, and West, was coming to an appreciation of what seemed its economic interest. The cotton States, given up to agriculture and to the raising of a great staple, much of which was exported, naturally objected to a tariff which seemed to be a burden on their industry for the benefit of the manufacturing and commercial North. In 1828 the so-called "tariff of abominations" was passed, a measure which in many ways merited its name. This aroused strong Southern opposition and ushered in a course of argument and protest against the action and assumption of the national government, which, with some variation, continued as occasion demanded till the outbreak of the Civil War.

South Carolina, as early as 1828, began to issue argument and objection to the exercise of what it deemed unwarranted authority by the central government, and by 1832 the theories were formulated on which were to rest nullification and the attempted secession of later years. The principles set forth by South Carolina were brilliantly announced by Hayne in the "great debate" with Webster in the Senate in 1830. Webster's eloquent sentences defending the Constitution as the supreme law of the land made deep impression on the people of the North; the inspiring oration, read in many households, put

into words for those unlearned in the law fundamental notions as to the character of the Union and the government. Hayne's able speech made no small impression at the South; and yet, when South Carolina, two years later, sought to put into practice the principle of state sovereignty, many of the Southern States declared her theories unsound and revolutionary. The full theory of state sovereignty and the doctrine of nullification was put forward by John C. Calhoun and exhibited in the State papers of South Carolina in declaring null and void within its limits the new tariff of 1832, which had been passed in place of the "abominable" act of four years before. Reduced to their lowest terms, Calhoun's theories, which were not improved in the 30 years that elapsed before they were tested on the battle-field, amount to this: The Union was a union of States, the Constitution not a law but an agreement between States; each State, being possessed of sovereign authority, must have the ultimate right to judge as to the validity of laws passed by the national government; an attempt to enforce a law declared null by a sovereign State would justify the State's retiring from the Union. These principles Calhoun declared constitutional and preservative, not destructive. The attempt of South Carolina to nullify the law of 1832 and prevent its enforcement was in part successful. Andrew Jackson, the President, a Western man without sectionalism, announced that the Union must be preserved and was ready to subdue rebellion by force. But after delay and much discussion, Congress passed two bills, one a force bill, the other providing for the gradual diminution of the tariff rates in the course of the succeeding 10 years. South Carolina withdrew her nullification ordinance; if she had not won all, she had given an example of what bold assertion might accomplish.

Before speaking further of the events of Jackson's administration (1829–37) into which the discussion of the tariff and of Southern objection have led us, we should return to the movement which caused the election of Jackson and accounts for some of the problems of his time. In 1824 there were four presidential candidates, Crawford of Georgia, Clay of Kentucky, Jackson of Tennessee, and John Quincy Adams of Massachusetts. Crawford was the "regular" candidate, but no one received a majority of the electoral vote, though Jackson had more votes than any other. The House, on which the choice devolved, elected Adams, partly because of the influence of Clay; and there was at once an outcry, heightened when Clay became Secretary of State, that a corrupt bargain had been made between Clay and Adams. It was said, too, that the will of the people had been violated by the failure to elect Jackson. The frontier general, therefore, "Old Hickory," a downright man of primitive instincts and native keenness, was chosen in 1828 as a popular representative. The National Republicans, who were now led by Clay, in the course of a few years were known as Whigs, a name adopted as a protest against the high-handed methods of Jackson. The Democratic-Republicans, shouting for Jackson and victory, were soon known as Democrats. The party continued for years to hold the confidence and win the suffrages of the people. Except at two elections, from 1828 until 1860, the Democrats were successful in electing their presidential candidate. With Jackson, elected as he was, and borne in with acclaim as the man of the people, came a strong Western aggressive spirit; and with him, too, the spoils system, which was partly a frontier denial of the need of expert service, partly a sordid desire for place, partly a protest against an official class which some vaguely thought undemocratic. Jackson was naturally opposed to the national bank, and toward the end of the first term of service came (1832) a great controversy over the rechartering of that institution, whose corporate existence was to end in 1836. A bill for rechartering was vetoed by the President. The followers of Clay denounced the veto, declared it usurpation, and appealed to the people at the polls, only to be once more defeated. The next year Jackson decided that the government moneys should no longer be deposited in the national bank, and this, the famous "removal of the deposits," was the occasion of great excitement in Congressional circles and of much recrimination in political oratory. But Jackson's cause, wise or unwise, was successful; the bank was not rechartered, and the State banks continued for some years to hold — when they did not lose — the national funds, which were, at a later time, transferred to the independent treasury. The State banks meanwhile, stimulated by a lust for federal deposits, grew surprisingly in number, though their available capital and special holdings did not correspondingly increase. The crude treatment of the delicate matter of finance, a treatment not unnatural for a frontiersman, may have had some influence in bringing on the panic of 1837, which ensued as Van Buren, Jackson's successor, took the presidential chair. Van Buren, as Jackson's heir, had to bear the odium of the hard times that followed; but in fact the financial disasters were deep-rooted and were an inevitable consequence of the wild speculation that had been in vogue for years, during which men, otherwise not devoid of sense, bought wild land with reckless confidence in immediate rise in value, and plotted towns on paper as if intention would by force of sheer desire transmute wishes into wealth. For three years and more the country suffered the pangs of commercial depression and of course in 1840 elected a Whig as President — William Henry Harrison, like Jackson a frontiersman, whose humble log-cabin was set up as a symbol of true, simple Americanism, as over against the luxury of Van Buren, who was charged with habits of obnoxious aristocracy. The Whigs had indeed taken a shaft from the Democratic quiver, and the thousands that gathered at the mass-meetings to shout for "Old Tip," as Harrison was called, were living proof that the day had gone by when the Whigs, even in conservative New England, could look askance at the Democrats as just a little below the proper social standard. For this the election of 1840, a time of shout and doggerel verse, of assertive and empty oratory, deserves notice in our political annals. It marks the final disappearance of any pretense on the part of either political party to stand above and aloof; it marks assuredly the time when the spirit of confident Jacksonian democracy was, in politics at least, the settled spirit of the nation. The frontier, "the most American part of America," had completed its conquest of the whole.

The Jacksonian period deserves a word dissociated from political maneuver. It was a time of physical and economic growth. New inventions found application in industry and multiplied the products of labor. New channels and new methods of transportation were put into use. When the Erie Canal was opened in 1825, the cost of transportation from Albany to Buffalo was greatly reduced. The steamboat, first used just before the War of 1812, had been of immense importance in building up the West, where the river system was especially adapted to the flat-bottomed steamers; but before 1840 steamships were crossing the ocean, offering facilities for the great tide of European immigration. The first steam locomotive built in the United States was built in 1825; in 1840 there were nearly 3,000 miles of railroad in operation. The emigration to the West went on at a rate more marvelous than before; population pushed on beyond the Mississippi, while such States as Illinois doubled and redoubled their population, and the little cluster of hamlets near the head of Lake Michigan began its rapid growth into the big, teeming city of Chicago. In intellectual and moral lines the American people were awake. New works of literature were written; new movements for public improvement and reform were undertaken; and with these manifestations of the humanitarian sentiment was a tendency, too, toward ideals, toward "soaring away," as Carlyle wrote Emerson, "after ideas, beliefs, revelations, and such like, into perilous altitudes."

When such a spirit was abroad, when men were planning reforms and taking a new outlook on life, it was natural that some one should protest against slavery. Garrison founded the 'Liberator' at Boston, and demanded the immediate abolition of slavery. The American Emancipation Society was soon formed. The extreme abolitionist, denouncing slave-holding as a crime, would consider no means to the end he desired, but insisted on the freedom of the blacks. Soon he was proclaiming the Constitution as "a covenant with death and an agreement with hell," and announcing that he would have no dealings or political communion with slave-owners. The South, wrought up to a strange pitch of excitement, acted with indiscretion; at least its voluble representatives were indiscreet enough; for the abolitionists were but a handful, and nothing served so well to bring them into notice and ultimately to give the antislavery cause standing as the vehement denunciation by the Southern men in Congress. Worst of all for the South, as it soon proved, effort was made to strangle free speech in Congress and to check the right of petition, an effort which resulted naturally in a heated discussion whenever the forbidden subject was mentioned, and increased by many thousands the number of antislavery petitions demanding abolition in the District of Columbia, or like measures. Finally the gag policy was abandoned, but it had accomplished an object the reverse from that intended. By 1840 an antislavery party, the Liberty party, was in the field, and the political movement which ended with the election of 1860 was begun.

Soon after 1840 arose interesting questions from which trouble ultimately came. Sometimes tariff and financial problems were under discussion, sometimes internal improvements and the dredging of rivers and harbors, sometimes matters of diplomatic concern; but underneath everything, though it did not always come to the surface, was slavery and the divergence of North and South. In 1836 Texas became independent of Mexico and asked for admission into the Union. Her separate existence was recognized by sending a minister from Washington; but there was for a time no serious movement for annexation. In 1840 Harrison and Tyler were chosen as President and Vice-president. Harrison died soon after the inauguration (1841). Tyler, though elected on a Whig ticket, was by training and predilection really more in sympathy with the tendencies of the Democratic party than with those of the Whigs. He did not participate with the Whig leaders in their movement to carry out their plans in regard to a new tariff and a new bank; and before the end of the term he had installed Calhoun as his secretary of state. An effort to bring Texas into the Union had now begun, but a treaty prepared to attain that end was rejected by the Senate. In 1844 the Whigs nominated Clay; the Democrats, Polk of Tennessee. Polk's adherents shouted for the tariff of 1842 and demanded the "reannexation of Texas," referring by these well-chosen words to the fact that by the treaty of Spain in 1819 we had surrendered our claim to the land beyond the Sabine. The Liberty party, taking a strong stand against slavery, cast a much larger vote than four years before. Polk was elected; and under the influence of the election, the gloom of the Whigs, and the enthusiasm of their successful opponents, the annexation of Texas was consummated (1845). The new State was brought in, not by a treaty as in the case of the acquisition of Louisiana and Florida, but by virtue of a joint resolution authorizing the President to invite Texas to come into the Union as a State. Texas was a slave State; her admission into the Union had been vehemently opposed by many Northern people because it increased slave territory and strengthened the hold of slavery on the land. Difficulties soon ensued, for Mexico was quite unwilling to surrender all the territory Texas claimed as hers and which we purported to have made our own. The new State claimed all the land from the old southwest boundary of the Union to the Rio Grande River. An effort to support the claim of Texas involved us in war with Mexico, a war which was not distasteful to Polk, who hoped it could soon be ended and that as a result he could obtain the far West stretching away to the Pacific. The war (May 1846–February 1848) was a long triumph for American arms, longer than Polk could have wished, but triumphant none the less. In September 1847, General Scott entered the City of Mexico, and the next February was signed the treaty of Guadalupe-Hidalgo, by which the United States secured the land westward to the ocean, and promised, besides assuming certain claims, to pay Mexico $15,000,000. There were thus added to the expanding republic, if we include Texas as the fruit of the war, about 875,000 square miles. In the meantime a treaty with Great Britain had been signed. The title of the United States to the Oregon country south of the 49th parallel was thus made secure. In 1853, by the Gadsden purchase, something like 45,000 square miles — the southern portion of what became the territories of

New Mexico and Arizona — were added to the national domain.

But the annexation of Texas and the new West immediately ushered in new difficulties. Even before the war was over there had come up in Congress the so-called Wilmot Proviso, the purpose of which was to exclude slavery from any land acquired from Mexico. In the election of 1848 General Lewis Cass of Michigan, the Democratic candidate, was opposed by General Taylor of Louisiana, one of the heroes of the war. The Free-soil party (q.v.), the successors of the Liberty party, presented Van Buren and Charles Francis Adams as their candidates. They believed that Congress was legally bound to forbid slavery in the territories, having, as they said, "no more right to make a slave than to make a king." Of these parties, the first two did not proclaim definite opinions as to slavery. Cass had, however, already announced that, in his opinion, the people of the territories should settle their domestic affairs for themselves, a doctrine which was later formulated as the doctrine of "popular sovereignty." The Whigs as a party were not opposed to slavery; they counted on Southern support and sympathy; but many of their Northern adherents, "the conscience Whigs," were strongly opposed to extension of the system. The extreme proslavery element in the country believed that Congress could not rightfully prohibit the Southern slave-owner from moving into the national domain with his human chattels and holding them there as his own. Taylor was elected; the Free-soilers, no longer an insignificant faction, polled over 290,000 popular votes and held the balance of power in some of the States, actually casting more votes in New York than the Democrats.

There were by this time many plain manifestations of the growing estrangement between the sections. There was indulgence in charges and countercharges. The South complained of the escape of slaves, the North of the Southern effort to extend slavery and of the existence of slavery in the District of Columbia. Religious denominations began to divide along sectional lines, and there were still other evidences that in many respects the Union was legal, political, and formal, that harmony was passing away. And yet, though perhaps the Southern people were in large measure united in defense of slavery, the great body of men at the North were not ready to act in unison in opposition to slavery or its extension. Not yet could the Free-soil party come near controlling either house of Congress. In the South the radical element had begun to talk of secession. Soon after the election of 1848 several matters demanded immediate attention. California, where gold had been discovered, was being rapidly peopled; the inhabitants formed a constitution excluding slavery and asked admission to the Union. Some form of territorial government was needed for portions of the West, and some answer must be made to the demand for abolition of slavery in the District and to the complaints of the South. Henry Clay introduced into Congress a series of propositions which furnished the foundation for the compromise of 1850. California came in as a free State; the slave-trade was abolished in the District of Columbia; a rigorous fugitive-slave law was passed; New Mexico and Utah were organized as territories without restriction as to slavery. In this compromise many hoped to see an end to sectional bitterness, but in vain. Before the compromise was passed, Taylor died and was succeeded by Fillmore. For a time indeed, there seemed to come a lull in the storm, and men breathed more freely. Both of the leading parties in the election of 1852 announced their adherence — one may say devotion — to the compromise as a settlement of the slavery question. The Free-soilers did not yield their ground, but they cast fewer votes than four years before. Franklin Pierce, the Democratic candidate, was chosen; General Scott, his opponent, received only 42 electoral votes out of the total 296.

But the cause of free soil was nearer consummation than ever, for the direful subject of slavery could not be compromised away. Efforts to enforce the fugitive-slave law met with resistance in some parts of the North, and the smuggling of the blacks by the Underground Railroad went on more briskly and cheerily than ever. And then came the Kansas-Nebraska bill (q.v.), introduced by Senator Stephen A. Douglas (q.v.) of Illinois, and defended with all the vigor and vehemence of which he was master. It was passed in 1854, and the notion that compromise had cast a permanent benign influence over the nation was shattered. The bill provided for the organization of two territories in land covered by the provisions of the Missouri act of a generation before, and both of them north of 36° 30′. The Missouri compromise was repealed and — in accordance with the principles of popular sovereignty — slavery was to exist in the territories or be excluded as the people of the territories might determine. For many Northern people, willing to acquiesce in the compromises, which they hoped had settled all dispute, the Kansas-Nebraska act was a rude awakening. The Republican party was formed, absorbing the Free-soilers, winning new adherents to the antislavery cause, and protesting against the extension of slavery into the territories. In the autumn elections of 1854 this party made a showing of remarkable strength, but in 1856 the Democrats were once more successful, placing James Buchanan in the presidential chair. Only one national party remained; the support of Fremont, the Republican candidate, was practically altogether from the Northern States.

From this time on there was little peace. In 1857 the Supreme Court, in the case of Dred Scott *vs.* Sandford, declared that Congress had no right to exclude slavery from the public domain. In 1858 Abraham Lincoln, in a series of debates with Douglas, while both were candidates for election to the Senate, disclosed, with pitiless logic and with plain, unembellished phrase, the incongruity between popular sovereignty and slavery. If the Supreme Court was right, the slavery issue could no longer be avoided by adhering to the notion that the people of the territories could exclude slavery if they chose; they could not lawfully exclude an institution that had the lawful right to exist within their limits. Lincoln thus inserted the wedge that split the Democratic party. In 1859 John Brown (q.v.), with some ill-defined hopes of doing service to the slaves, further embittered the South by invading Virginia. The Southern people, inspired by fear of a servile revolt, were

aroused to great indignation, and the Northern abolitionists, with whom were classed all Republicans, were accused of plotting against Southern safety. The time was near at hand when only blows, not words, could settle the great question at issue between the sections, daily growing more hostile. In 1860 Abraham Lincoln was chosen President; the Republicans were successful, and South Carolina began preparations for setting herself up as a separate nation. State after State at the South adopted ordinances of secession. Through the winter of 1860-1 there was little opposition to the movement. Even many Northern men, strongly antislavery in sentiment, doubted the wisdom of "pinning" one section to the other by bayonets. Attempts at compromise — the Peace Convention, the Crittenden resolutions — were failures. Lincoln, a man almost unknown to the great body of the nation, paid close attention to the events of the winter, and when he took the oath of office in March 1861, spoke firmly. He asserted the illegality of secession, and declared that the Union was unbroken and the laws must be executed.

War began when the Confederate forces fired on Fort Sumter in Charleston Harbor. Lincoln called for 75,000 volunteers, and there was immediate response at the North. Events now moved rapidly. Arkansas, North Carolina, Virginia, and Tennessee were soon out of the Union. Kentucky, Maryland, Delaware, and Missouri, border States with slavery, did not join the Confederacy. On 19 April Lincoln declared the blockade of the southern coast. On 13 May England proclaimed her neutrality. Richmond, Virginia, had become the capital of the Confederacy, and at the North rose the cry, "On to Richmond!" The complete defeat of the Union forces at Bull Run 21 July 1861, revealed to the North the magnitude of the task undertaken. The South had in some ways the advantage at the outset, for the North was the invader, and the South defending its own soil. The task of conquering a country as large as the Confederacy was enormous. Moreover, during the early years of the war, the Southern armies were more ably led and there was less confusion of counsels. Robert E. Lee was one of the most skilful generals of history, and not till the war was more than half finished did the North find Grant, Sherman, McPherson, Sheridan as the equals of Lee and his efficient lieutenants. But, in the long run, the North was destined to succeed because it was stronger, because in the contest for supremacy between free and slave labor the South had been hopelessly beaten; and thus the contest on the battlefield but made plain with arms what the economic forces had already accomplished. The North had more men, more wealth, more vigor to put into the conflict. The South, raising cotton, which was indispensable to the industrial interests of Europe, hoped and expected European intervention, but did not secure it. The belligerent rights of the Confederacy were recognized, but its separate independent existence was not. The coast of the Southern States was declared in a state of blockade, and the Federal Government began the enormous task not only of fighting on the battle-field, but of surrounding and strangling the uprising against its authority. In the west the Northern armies, though not always successful, pushed the Southern forces slowly before them. In July 1863, Vicksburg surrendered to Grant. Shortly after the Confederates inflicted decisive defeat on the Union forces under Rosecrans at Chickamauga. In the autumn the victory at Chattanooga, where Grant, ably supported by Hooker, Thomas, and Sherman, overwhelmed the Confederate forces, was a crushing blow for the Southern cause west of the Appalachians. The next year Sherman entered upon an aggressive campaign, taking Atlanta and then marching through Georgia to the sea. But in the east difficulties seemed to multiply in the early years. Robert E. Lee of Virginia, aided by staff commanders like Jackson and Longstreet, seemed for a time absolutely invincible. Successful in defeating McClellan in the Peninsular campaign of 1862, Lee soundly whipped Pope near Bull Run the same year. Driven back from Maryland by McClellan, who attacked him at Antietam, he defeated Burnside at Fredericksburg, and Hooker the next spring (May 1863) at Chancellorsville, and with a victorious army marched boldly into Pennsylvania, where he was repulsed by Meade at Gettysburg. The next year Grant, the victorious Western leader, taking command in person of the Eastern army, began his fearful "hammering" and led his men to ultimate victory. Lee surrendered at Appomattox 9 April, and the Confederacy collapsed in the spring of 1865. The energy of the free North seemed unabated; the South had been unable to supply Lee, its great commander, with men and supplies sufficient to meet the enormous weight of Northern arms, when wielded by a general of the first order.

At the close of the war the North had over 1,000,000 men in arms; the loss in battle and by disease had been great,— not far from 300,000 men. The Southern loss was presumably not much less. The expenditure of wealth had likewise been enormous; in fact, the real loss is incalculable, for no one could even estimate what the South had given up. When the war ended, the national debt was $2,850,000,000; and in the four years nearly $800,000,000 had been raised by taxation. The expense of the war of defeating the Confederacy was increased by the hesitation of the government to resort to adequate taxation and by the issue of legal-tender paper, a measure possibly justified by political considerations. In July 1864, gold touched 285, and this meant an excessive price for other commodities, which were in the long run paid for in good money. On the other hand, the establishment of the national bank system by the acts of February 1863, and of June 1864, greatly facilitated the government's control of the national resources.

At the beginning it was not thought at the North that the war was a war against slavery. In July 1861, Congress declared "the war is not prosecuted . . . for any purpose of conquest . . , nor for the purpose of overthrowing . . . the rights or established institutions of those States, but to . . . maintain the supremacy of the Constitution . . . and to preserve the Union with all the dignity, equality and rights of the several States unimpaired." But in the course of the struggle, slavery was doomed to fall. Foreign opinion and radical Republicanism alike demanded its destruction. Whatever might be said to the contrary, slavery had caused the war. On 22 Sept. 1862, Lincoln issued the Proclamation of Emancipation, declaring free all persons held

as slaves within any State or parts of States in which the people should be in rebellion the following 1 January. But the Proclamation of Emancipation was a mere military order; its efficiency upon the ensuance of peace was therefore open to question. Moreover, it did not affect slavery in the loyal border States. In February 1865, the 13th Amendment was proposed to the various State legislatures, and the following December it became a part of the Constitution. The Civil War resulted in the freeing of 4,000,000 slaves, and in demonstrating the American Union to be, in the words of Chief Justice Chase, "an indissoluble Union of indestructible States."

Even before the war was over, the question had arisen as to how the Union could be reconstructed; in case the South was beaten, what steps should be taken to establish the Southern States once more in their constitutional relations? The early Republican theory had been that the States could not secede, and hence it could now be logically argued that the States, having never gone out, were still in the Union. Lincoln's theory was not inconsistent with this idea; to him the task of Reconstruction was not to restore the States, but to see that the governments were in the hands of loyal men who would do their duty as citizens of the United States. The assassination of Lincoln, 14 April, 1865, brought sorrow to millions of devoted people at the North. His successor, Andrew Johnson, was not well adapted to the difficult and delicate work that lay before him. On the one hand was a distracted South, overwhelmed with defeat; on the other was a triumphant North made up of different factions: (1) the radical Republicans, whose antagonistic spirit had been aroused by conflict; (2) the extreme advocates of negro rights like Charles Sumner, who acted in most respects with the radical partisans; (3) a number of men who had been acting with the Republicans but whose antecedents were those of the Democracy or whose inclinations held them with fragile threads to the Republican party; and (4) lastly the Democrats, who were strong in opposition. Johnson could not possibly hold together the elements on which he must rely. The fault was not altogether his; the situation was replete with difficulties. And yet, if ever a nation needed wisdom and unselfish service rather than partisan bitterness and strife, it was during the trying years of Reconstruction that followed on the heels of civil war. Lincoln had (July 1864) refused to sign the Wade-Davis bill, which proposed a plan for Congressional participation in the process of Reconstruction. Johnson, like his predecessor, believed that Reconstruction could be accomplished by executive methods. In May he issued an Amnesty Proclamation. By December the governments of most of the Southern States had been established in accordance with the presidential plan, which practically put the States in the hands of those willing to take the oath of allegiance. Representatives came to Washington from nearly all the Southern States. But the process of Reconstruction was not to be so easy. Already Sumner had given utterance to his State-suicide theory, the theory that a State by virtue of rebellion lapsed into the condition of a territory. Thaddeus Stevens had announced the conquest theory, in accord with which the South was to be looked on as conquered territory and treated as such by Congress. Members of Congress were not ready to turn the problem over to the President, and little by little the breach between the two departments of the government widened. The Democrats supported Johnson's plans, the Republicans opposed, and soon the President and the leaders in Congress were bitterly hostile. By degrees the enmity between Johnson and the Republicans became so bitter that he was impeached for venturing to disregard the Tenure of Office Act by removing Stanton, the Secretary of War. The Senate failed to convict him.

Then came news of acts passed by the Southern legislatures which appeared to Northern people to be attempts to avoid the 13th Amendment and reduce the negroes practically to slavery once more. A joint committee on Reconstruction now took charge of affairs, and the legislative branch of the government, passing important measures over the President's veto and denying the Southern States representation in Congress until certain demands were met, controlled the situation completely. The purpose of the Republican leaders was to give predominance to the "party of the Union" in the South. The Freedmen's Bureau had already been established to care for the freedmen. The Civil Rights Act was enacted; and soon after, the 14th Amendment was submitted to the States for adoption (June 1866).

With the exception of Tennessee, the Southern States refused to ratify the amendment, but their refusal was of no avail; the South was put under military government, and no State was admitted to representation until it had accepted the amendment. In 1868 the measure was adopted; it was of immense importance. Under the original Constitution, the liberty of the individual was in nearly every respect in the hands of the State; by the 14th Amendment it was declared that no State should "deprive any person of life, liberty, or property, without due process of law, nor deny to any person within its jurisdiction, the equal protection of the laws." It also provided that there should be a reduction of representation of any State that abridged the right of male citizens 21 years of age to vote. The chief purpose of the amendment in this particular was to cut down the representation of those Southern States that did not give the ballot to the negro. Two years later the 15th Amendment was enacted, declaring that the right to vote should not be abridged "on account of race, color, or previous condition of servitude." The last three amendments were the most evident constitutional products of the war. The last State to be admitted to the privileges of the Union was Georgia (July 1870). In the meantime conditions had been bad in the South. "Carpet-bag" governments had entered upon their work of wasting the substance of the already impoverished country. The Southern people began by all sorts of methods to throw off the burden of domination by ignorant negroes and dishonest whites. Some of the latter were indeed honest, but the results of "carpet-bag" rule were deplorable. Not until 1877 were the Federal troops withdrawn from all parts of the South and the Southern people suffered to manage their political affairs as they had done before 1861.

In 1868 General Grant became President. During his time the difficulties in the South continued and long gave no sign of real betterment. Only gradually was the trouble cleared away and a better feeling between the sections established. The most important fact of Grant's first administration was that Great Britain and the United States agreed, by the Treaty of Washington, to arbitrate the matters in dispute between them. During the war the former power had strongly objected to England's conduct in allowing vessels that were to be used to prey on Northern commerce to be fitted out in her harbors. The most noted of these was the famous Alabama, which, after doing immense damage, was sunk by the Kearsarge in a fight off the coast of France. The Court of Arbitration, which was provided for by the treaty, meeting at Geneva, awarded to the United States $15,500,000 as damages for the injuries inflicted. In the election of 1872 the Liberal Republicans appeared in opposition to the regular Republicans. They demanded reform in the administration of government and that the government cease its interference in the affairs of the Southern States. The movement marks the beginning of the gradual rearrangement of parties.

The Republican party had absorbed the Union element of the North and had attracted the support of even earnest war-Democrats; but confronted with new problems, now that slavery was gone and the Union intact, the party naturally could not hold all the persons whom the pressure of war had brought within its lines. The Democrats supported the Liberal Republican candidate, Horace Greeley, but Grant was successful. His second administration was marred by a number of serious official scandals — the Whiskey Frauds, the Credit Mobilier, the Salary Grab — and there was a widespread feeling that all was not done to ferret out rascality. The panic of 1873 occurred: perhaps it was a natural result of the war; certainly it was not to be wondered at in the light of extravagant speculation in a country still burdened with a load of paper money. And yet, in spite of all the country had endured, its population and wealth had greatly increased since the outbreak of the war, and, notwithstanding evidences of a loose and even dangerous spirit in public affairs, the people had, on the whole, withstood remarkably the deleterious influences of long civil strife.

In 1876 Samuel J. Tilden was nominated by the Democrats and Rutherford B. Hayes by the Republicans. The election was hotly contested and when the ballots were counted the result was still in doubt. Twenty electoral votes were in dispute — one from Oregon and the remainder from South Carolina, Florida, and Louisiana. Tilden had received, undeniably, 184 votes and needed but one to have the requisite majority. The situation, fraught with manifest danger, was without precedent, and one for which there was no adequate constitutional provision. By agreement between the Republican Senate and the Democratic House, an Electoral Commission was created, which determined the contest in favor of Hayes. The Democrats, with true patriotism, accepted the result with calmness. The new President, a man of sound judgment and fine character, by his frank and friendly conduct helped in the restoration of a better feeling at the South. The Federal troops, as we have already said, were withdrawn from the Southern States, and at the end of the administration much of the bitterness between the sections, which had lasted for a generation, had disappeared. The Republicans were again successful in 1880, electing James A. Garfield as President and Chester A. Arthur as Vice-president. The administration had scarcely begun when Garfield was shot, and he died in September 1881. Arthur succeeded to the presidency and performed its duties with conservatism and good judgment. The administration was, on the whole, uneventful; the country was prosperous; the policy of resumption of specie payments had been adopted some time before and had been carried quietly into execution at the day set (1 Jan. 1879); the monetary basis of industry was good, even if not perfect; the immense debt entailed by the war had been largely reduced; the revenue of the government was so large that a surplus had been created which presented its own difficulties. The foundation of better government was provided for by the establishment (1883) of a Civil Service Commission. In 1884 the Democrats nominated Grover Cleveland and the Republicans, James G. Blaine. There was considerable defection in the ranks of the latter party, for, while many persons gave the candidate enthusiastic support, others were unwilling to vote for him and announced their preference for Cleveland, who by his vigorous administration as governor of New York had won confidence and respect. The disaffection of the "Mugwumps," as the dissatisfied Republicans were called, proved to be a matter of some importance, for Blaine was defeated, and the Democrats, for the first time since the election of Buchanan in 1856, placed their candidate in the presidential chair. During Cleveland's term, and in large measure because of the influence of the President himself, the tariff issue became paramount. The Republicans strenuously adhered to the doctrine of protection and discountenanced all efforts to reduce the revenue by a lowering of duties, while their opponents, declaring all unnecessary taxation unjust taxation, attacked the high tariff as unwise and harmful. This was the main question, therefore, in 1888, when Benjamin Harrison, the Republican candidate, was successful over Cleveland. Four years later, however, on a platform not very different from that of 1888, the Democrats, having nominated Cleveland for the third time, were successful. The years that followed were full of interest. A serious wordy altercation with Great Britain concerning the boundary of Venezuela was finally settled. In Harrison's administration a revolution had occurred in Hawaii, and a treaty of annexation had been framed, but not ratified. Cleveland withdrew this treaty from the consideration of the Senate, and announced that the American protectorate which had already been set up in the islands was at an end. The tariff question was the subject of much discussion, and Congress passed, after much trouble, the Wilson bill, reducing the tariff in some degree, but satisfying neither party. In the spring of 1893 there were the beginnings of a disastrous financial panic; the monetary condition of the country was bad. In 1873 silver had been demonetized, but a few years later (1878) the Bland-Allison Act had provided for the government's purchasing and coining a limited amount of silver;

in 1890 the Sherman Act was passed, by the terms of which silver bullion was to be bought periodically and paid for in treasury notes. The government thus was a heavy holder of silver, and there was doubt as to the ability of the government, under the circumstances, to adhere to the gold standard. In 1893, under the pressure of the panic, the Sherman Act was repealed, but trouble continued and not for some years was there a return of business prosperity. The hard times were doubtless, like the difficulties of 1837 and 1873, not altogether due to the state of the money of the nation, but to many other causes as well. In 1896 the silver question was thoroughly debated. William J. Bryan of Nebraska was nominated by the Democrats on a platform demanding the free and unlimited coinage of silver and gold at the ratio of 16 to 1. William McKinley was selected as the Republican candidate on a platform declaring opposition to the free coinage of silver except by international agreement. The campaign awakened great interest among all classes of voters and resulted in the election of McKinley by a large popular and electoral majority. In the course of the administration a new tariff law was passed, and also an important act for the establishment of the monetary system. But, of course, most important of all was the war with Spain, which ended in the independence of Cuba and in the annexation of Porto Rico and the Philippines. (See UNITED STATES — SPANISH-AMERICAN WAR.) McKinley and Bryan were again in 1900 the candidates of their respective parties, and the former was again successful. McKinley was shot by an anarchist at Buffalo in September, after his second inauguration, the third of our Presidents to meet death from assassination. His successor, Theodore Roosevelt, assumed the duties of office. His administration is too recent to need comment or description. The most important events were the great coal strike of 1902, which was finally settled by arbitration, the recognition of Panama as an independent State, the conclusion of a treaty for making the Panama Canal.

A sketch of American history, however short, cannot well be ended without a word as to national development. Since the adoption of the Constitution the population has grown from about 4,000,000 to 80,000,000. Less than 100 years ago the Mississippi was the western boundary; but even the Pacific did not stay the expansive movement — Alaska has been annexed and dependencies are held in the far Pacific. Wealth has enormously increased. The debt that lay like a weight on the new republic when Washington was made President could now be wiped out by the expenditure of two days' income of the national government, while some private individuals would not unduly strain their private credit by the assumption of the whole amount. Commerce and industry have likewise marvelously increased. With the increase of population and wealth there has come, especially since 1861, a development of the functions, scope, and authority of the national government. The central power has assumed new responsibilities, and the old questioning as to the right has nearly disappeared. With regard to this, questions of constitutional right might perhaps be justly raised, but on the whole the development of the national government is but an indication of the increasing number and importance of general interests, which reach beyond the limits of any restricted locality. It is like the growth and concentration of authority visible everywhere in industrial life and noticeable in many matters of merely social character. The result of the Civil War was, of course, to strengthen the hands of the central power, as well as to make the nation unquestionably a national State, while the Spanish war brought new obligations and wider responsibilities.

ANDREW C. MCLAUGHLIN,
Carnegie Institution, Washington, D. C.

2. United States — Causes of the Revolution in the. The political and constitutional relations between Great Britain and the English dominions in America in 1760 were ill-defined, and fundamental understanding between the English communities on the two sides of the Atlantic as to the essential qualities of the connection was lacking. In England an Act of Parliament had come to be regarded as the highest expression of power within the Constitution and the range of subjects over which Parliament's power extended was unlimited. In America the full consequences of the omnipotence of Parliament were obscured by the fact that its power had been actually exercised over the colonies only for the purpose of establishing, protecting and maintaining a commercial system of imperial extent and character, and in a manner which left the internal concerns of each colony largely under the direction of its local government. The superintendence of the colonial governments was in the hands of the Crown, under whose administration a considerable degree of local autonomy had been attained. The situation was further obscured by the fact that within the very realm of commercial regulation, which constituted so large a part of the region of the exercise of Parliamentary power, the administration was notoriously inefficient. So that in the generation before George III., the system remained largely unexploited by Parliament and its true character and possibilities unappreciated by the Americans. Under these circumstances, it is evident that, if, after a long period of indeterminate relation, the issue as between Parliament and the colonies should be raised at all, much would depend upon the manner of its raising and on the circumstances that surrounded two sides at the time.

English political conditions at the beginning of the reign of George III. were such as to afford peculiarly little promise that such a delicate relation would be handled with the requisite skill. The vicissitudes of the party system, the personal views and characteristics of the young king and the circumstances connected with his accession, all combined to make the question of the ultimate position of the Sovereign in the Constitution the absorbing issue of the time. The Whigs sought a strong and permanent system of government in "the connection of agreeing politicians commanding parliamentary influence"; the Tories, "in the creation of a powerful parliamentary interest attached personally to the Sovereign, reinforced by disconnected politicians and by small groups drawn from the most various quarters and directed by a statesman who was personally pleasing to the king." Wide interpretation of the power of Parliament and Crown acting together was es-

sential to both parties and issues requiring moderation and restraint together with firmness and steadiness in the use of this power by either party stood little chance of receiving attention on their merits. The demoralization of the Whigs and the intractable attitude of Pitt made it possible for the king and his "friends" to restore for a time the personal will of the Sovereign to a position of greater power in the Constitution. But the price of this success was the utter demoralization of parties and the party system of government, which was the direct cause of the vacillation, the violent alternation between severity and indulgence toward the colonies in ministerial policy, which was itself largely responsible for the unnecessary degree of turbulent defiance of existing authority, particularly in Massachusetts.

Turning now to America, we find political conditions between 1688 and 1760, by influences outside of what was strictly the law of the situation, developing the several colonies into a group of actual commonwealths in which the forces of democratic society had far greater sway than in England and in the long run predominated over the aristocratic forces directed by the official classes. What the English Government thought of as corporations emanating from the Crown but subject to ultimate Parliamentary regulation, had grown into such an actual position that, whatever the technical law of the situation, it was inexpedient to treat them merely as corporations. The corporate provinces had governments almost entirely developed from native sources and the limited control over them for imperial purposes attempted by the Home Government met with much obstruction. The same was true, though to a less degree, of the proprietary and royal provinces, for, though the official opportunity for enforcement of control was much greater, the weakness of the support given from Home to the provincial governors in their contests with the legislatures left the latter the practically dominant power in the realm of provincial development. The modelling of each provincial government on the lines of the whole English Constitution, the wide range of interest taken into cognizance by each, extending to well-nigh everything but regulation of imperial commerce, the territorial scale on which provincial interests developed, the large degree of success which the representative legislature attained in controlling this development, often in defiance or evasion of directions from Home, the isolation from the rest of the colonies within which each of these developments was conducted, all contributed to a view of itself by each province as a constituent part of a federative empire.

For such a theory of Empire, however, the English community on the European side of the Atlantic was very far from ready. By the letter of the law of the situation as most authoritatively interpreted at the time, colonial affairs were as much in the hands of Parliament as any other interest of the British nation. When, then, the new circumstances of the Empire created by the results of the Seven Years' War (q.v.) seemed to call for a policy which should (1) enforce the system of trade regulation more effectively, (2) provide for a standing military force for the control of the newly acquired territory and (3) provide a revenue from America which should prevent the addition of the burden of expense thereby entailed to the already huge national debt, it is not surprising that, on the one hand, the ministry should take colonial obedience for granted, and on the other, that the colonists should take fright at the possibilities of oppression involved in the unlimited exercise of Parliamentary power. At all events, acts covering the above purposes were passed in 1764 and 1765. It is only fair to note that experience under the indeterminate relations previous to 1760 had been such as to lead the ministry not unnaturally to believe that unless these objects were secured by action of Parliament they would not be effectually secured at all. It is also to be observed that, whereas the power of Parliament to tax the colonies had actually been used only to regulate commerce and not to raise revenue, it is, in strict logic and in practical administration, impossible to admit the power to tax for one purpose without granting it for the other.

Of this three-fold programme, distasteful in all its features to the Americans, the Stamp Act (q.v.) involved the greatest degree of novelty, invading, as it did, what imperial administration had hitherto left untouched — control of the legislature of each colony over the granting of supplies to the Crown. Upon this feature American resistance was concentrated and before the time set for the Act to go into effect it had been practically nullified by the use of a variety of means, including mob violence as well as the resolutions of legislatures and of a Congress of delegates from a majority of the colonies. The basis of remonstrance was the contention that the granting of supplies from themselves for the use of the Crown by any body in which they were not personally represented was in violation of the fundamental principles of the Constitution. The English reply to this — that the colonies were virtually represented in Parliament as much as many sections and interests in England itself were — was probably quite in accord with the historic meaning of the word representation as it had progressively developed in England. But in America variations from this meaning had developed which made the theory of virtual representation in American eyes inapplicable to the case. To Americans the idea of representation adequate for taxing purposes included a franchise regulated by general rules and possessed by practically all free adult white males with a moderate amount of property, and an apportionment of representatives based on territorial and popular considerations rather than on those of "interest." In all of these points the contrast with English ideas of representation was fundamental and these variations in understanding of this term help to account for the blindness of each side to the justice of the contention of the other. This theory of representation involved in matters of taxation what has already been referred to in another connection, a theory of federative Empire, while the English theory was that of consolidated Empire, directed by Crown and Parliament, with the colonial governments as corporations, with somewhat extended powers, to be sure, in consequence of their peculiar circumstances, but ultimately subject to complete regulation by Parliament. The attempt to enforce the revenue feature of the

Grenville policy partially revealed the divergence between these two theories. The issue was raised on the specific point of revenue; on this point the colonies successfully resisted and in the repeal of the Stamp Act in 1766, Parliament, on the specific point retreated, at the same time asserting by the Declaratory Act its power over the colonies "in all cases whatsoever." Though the American resistance to the Stamp Act policy was undoubtedly a surprise to the ministry, once the incident was closed, even by such an inconclusive settlement, every effort of the government in matters of colonial policy should have been directed toward the achievement of an arrangement which should provide for development of imperial welfare without raising the issue as between Parliament and the colonies in bare and abstract terms. Instead, the ministry, now dominated by the king's personal influence, chose to raise the issue as plainly as possible by proposing a revenue scheme which technically respected the colonial distinction between external and internal taxation but in all other points carried out the essential aims of the Grenville policy. This was the real significance of the "Townshend Acts," passed in June and July 1767, and the thorough-going character of the American resistance to these Acts was serious in a degree corresponding in ratio to the plainness with which the issue of Parliamentary legislation, in distinction from Parliamentary taxation, was thus raised. Again owing to changes in the ministry and to complaints from commercial sources the Townshend legislation was repealed in 1769, except for taxation on the single item of tea, which was retained, in set terms for the saving of Parliamentary right. By this time the colonists had had experience of the consequences of the English theory of Empire, under Parliament as it then was, and they now formulated their position in the phrase, "No legislation without representation." The issue between Parliament and the colonies over the fundamental question of the character of the Empire — federative or consolidated — had now been stripped of most of its disguises. Upon the issue, as thus stated, king and Parliament were in essential agreement, the differences between the various groups in Parliament, and between these groups and the king, being rather concerned with the question of the most effective use of this unrestrained power. But between 1770 and 1774 irritation was developing in an increasing and dangerous degree between the imperial officials and the colonial populations. Events like the so-called "Massacre" at Boston in 1770, the destruction of the Gaspee in 1772, and the tea riot at Boston in 1773 led the ministry to adopt coercion of the most unqualified kind. By the Acts of 1774, aimed at the punishment of Massachusetts, by the closing of the port of Boston, altering the government of the province, and making new and special provision for the quartering of imperial troops, the full possibilities of the theory of the Parliamentary consolidated Empire were revealed to the colonies in general. But instead of the isolation of Massachusetts, which the ministry intended, a closer union of all the colonial governments was the result. Throughout the whole course of the agitation the impulse and the machinery of intercolonial discussion and action had been developing, and on the summons of Massachusetts a Congress of delegates from 12 colonies met at Philadelphia in September 1774. This Congress gave expression to the colonial doctrine, and provided for bringing pressure to bear on the commercial interests of Great Britain by organizing a continental scheme for non-importation of British goods. The great result of the Congress was to enlarge the scene of opposition to the ministry from Massachusetts to the colonies as a whole. In the newly elected Parliament which met in November 1774, measures were taken still further to carry out the policy of coercion and, if possible, to divide the colonies, by providing for a general strengthening of the military force in America and forbidding the privileges of the fisheries and of trade with England to all but New York, Delaware and North Carolina. Schemes of conciliation were proposed but received only partisan consideration. Passion was now too highly involved on both sides to allow of success for any moderate or compromising plan. Any permanent scheme of governmental relations requires mutual confidence to a certain degree and this confidence had been broken down by the circumstances of the agitation of the previous ten years. Before the news of further action by Parliament in the direction of coercion had reached America, the extra-legal organization of Massachusetts, which the opponents of ministerial policy had set up there after the alteration in the provincial goverment, came into armed collision with the military forces of the Crown at Lexington and the military phase of the Revolution had begun.

Armed resistance to the ministerial policy, even in the organized manner and on the serious scale with which it was carried on in 1775, probably did not appear to the majority of Americans at first to involve necessarily a separation from the Empire. And yet the possibility of such an event as a last resort could not have been entirely absent from the minds of thinking men. It is in the sense of a determined and deliberate aim at such separation on the part of the average substantial citizen, that general disclaimers of the idea of separation should be interpreted. Such a project was probably in the minds of some of the leading agitators from an early stage of the controversy. But it was not until the consequences of the determined stand of the king and ministry on the issue of coercion thoroughly carried out had been manifested and the elements of passion, prejudice and interest injected still more vigorously into the situation, that independence could be made to appear desirable or necessary. The king's rejection of the "Olive-branch Petition" and the proclamation naming the Americans as rebels, in August 1776, as well as the employment of foreign mercenary troops, on the one hand, and, on the other, the appeal to local interest made by the experience of the newly organized State governments, as well as the inability of the moderate party in America to propose any plan which promised success in achieving what was now regarded as essential, all had a powerful effect and served to obliterate the recollection and valuation of the possible advantages of connection with Great Britain under more normal circumstances. All these considerations were popularized and brought vividly to the imaginations of great numbers by Paine's pamphlet,

'Common Sense.' By May 1776, the Congress, which had acted for a year as a revolutionary general government for the United Colonies, felt justified in entering upon consideration of the subject. Increasing consciousness of the need of foreign assistance, and clearer perception of the necessity of independence as a condition of such assistance enforced the more strictly domestic reasons for the development of the sentiment of separation and on 4 July 1776 the formal Declaration was signed.

In summary, it may be said that, fundamentally, the causes of the American Revolution are to be found in the differences of characteristics progressively developed in the two English communities on the different sides of the Atlantic. These differences made the administration of the system of government by which these communities were connected a matter of difficulty under any circumstances. When a change was made in the manner and purpose of the administration of this system, an issue was raised which the English community was particularly ill-prepared to meet. The Americans practically demanded recognition of a new theory of the Empire, precedents for which existed, not in the law, but in the facts of administration of the existing theory. At the beginning of the controversy the apprehensions of the Americans were concerned with the possibilities of the existing theory for despotism than with any serious tyranny actually exercised. But the conduct of this controversy over this issue was so unskilfully managed, as it turned out, that the feelings of discontent operative in the colonies for nearly a century were stimulated to the point of resistance. Opportunity was created for what was probably hardly more than a large and aggressively active minority to carry this resistance to the point of separation from the mother country. That a more skilful management of the controversy would have prevented the ultimate separation cannot be affirmed with confidence. The scale and character of the development of the colonial governments was making of them commonwealths not likely to be satisfied with a relation very far short of that which existed between Canada and England after 1837. And for such a relation England was hardly prepared much before that date. See Colony.

Bibliography.— Fiske, 'The American Revolution'; Trevelyan, 'The American Revolution'; Lecky, 'History of England in the Eighteenth Century,' Vol. III.; Doyle, Chap. V. in 'Cambridge Modern History,' Vol. VII.; Bigelow, Chap. VI. in 'Cambridge Modern History,' Vol. VII.; Osgood, 'The American Revolution,' 'Political Science Quarterly,' March 1898; Winsor, 'Narrative and Critical History,' Vol. VI.; Frothingham, 'Rise of the Republic.'

Charles Worthen Spencer,
Professor of History, Colgate University.

3. United States — The American Revolution (Military Events). The fundamental fact in the British strategy of the American campaigns was their possession of control of sea-power, for the use of which in penetration of the seaboard strip by the openings of the Hudson River and Chesapeake Bay, the topography afforded pre-eminent opportunities. In defense the Americans had the advantage of moving rapidly on lines of interior communication; and the holding of a position somewhere between the coast and the mountains from which they could keep control of these interior lines and thus prevent the success of British detachments, quite as often by refusing as by giving battle, was an essential feature of American strategy throughout the war. As a matter of fact, both sides were seriously handicapped in the course of working out their respective policies. On the American side, the prejudice against a standing army, the undue influence assumed by the States after the first flush of the enthusiasm of the Union had passed and the precarious character of the support given to military operations made the maintenance of a reliable military force a matter of supreme difficulty for the genius of Washington himself. On the other hand, after 1778, the British were involved in war with France, after 1779, with Spain, and after 1780, with Holland, and in this quadruple contest found no allies.

The first three years of the war constitute, in a way, the most critical period from the strategic point of view, for it was in these years that the British held undisputed possession of all the military advantage which control of the sea could give, and it was in this period that their most serious attempt to break the confederacy in two by occupation of the Hudson-Champlain-Saint Lawrence waterway was made and frustrated. In 1775 the Americans succeeded in keeping the British force confined in Boston while the attempt at the capture of Quebec by a double expedition north from Ticonderoga and northwest and west through the Maine forest under Montgomery and Arnold was made. This invasion collapsed and the evacuation of Boston by the British in March, 1776, left each side in possession of its own territory.

The campaign of 1776 saw the British attempt at occupation of a Southern port, Charleston, repulsed, and the advance south from Canada checked by Arnold's impromptu naval force on Lake Champlain till so late in the season that it got no further than Crown Point. New York, however, was occupied by the British army, supported by the fleet, and Washington's army was forced across New Jersey, leaving the mouth of the Hudson and large parts of both East and West Jersey in the hands of the enemy — supposedly for the winter. But Washington's masterly surprise at Trenton and maneuver at Princeton in the last days of 1776 enabled him to hold northern New Jersey and keep the British confined to New York city and East Jersey only as far as Amboy and New Brunswick. The campaign of 1777 should have been devoted by the British to the single great object of occupying the whole length of the Hudson-Champlain-Saint Lawrence waterway, both ends of which lay in their possession. This fact made it the most available opening for their purpose and once the connection between the termini was made, the task of reducing the confederacy by sections would become practicable. But Howe's move on Philadelphia by sea so reduced the strength and delayed the co-operation of the force at the mouth of the Hudson with the southward movement of Burgoyne that the latter, hindered in his movements and unable to maintain himself at so slow a rate of advance, was surrounded and captured before the former had

covered half the distance between New York and Albany. It is impossible to overestimate the importance of this achievement of the Americans. It made possible the French Alliance, which not only increased the military resources of the American defence by the use of the French sea-power, but involved the dispersion of the total military resources of the British against several opponents instead of allowing them to concentrate on the task of subduing the Americans. The consequences became apparent in the campaign of 1778 which was opened by Clinton's withdrawal from Philadelphia across New Jersey toward New York, close-pressed at Monmouth by Washington, who now took up a position north and west of New York, from which he could watch and attack any movement of the enemy toward either New England or Philadelphia. This position these armies practically maintained without decisive engagement till the end of the war. There was an attempt of the French fleet and American land force against Newport in 1778 which ended in failure. There were numerous marauding expeditions by the British, designed to draw Washington from his commanding position. There was on the other hand the capture of the posts in the country west of the Alleghanies in 1778 and 1779 by Clarke, which had important consequences for the future development of the country. But from 1778 on, the most active endeavors of the British invading force were directed against the Southern States. The bold dash of Wayne on Stony Point in 1779 and the narrow escape from loss of the Highlands of the Hudson through Arnold's treason in 1780 were only episodes in a situation in the North which showed no decisive changes from 1778 to 1781.

The British attack on the South was renewed in 1778 by the capture of Savannah and the reduction of the greater part of Georgia. The British seem to have counted on the large number of slaves in the Southern States as an element of weakness in the defensive capacities of the region and to have planned to roll up the South from Georgia to Virginia by combining use of sea-power with the threat at the altars and fires of the interior by an overrunning force. An attempt in the summer of 1779 at a recapture of Savannah by the combination of the French fleet and American and French land force under Lincoln was repulsed. The capture of Charleston in 1780 by the British fleet and army made the soil of the Carolinas for the two following campaigns the scene of an interesting conflict between two efficient armies, each under competent leadership, and, at first, on something like even terms, as far as aid from local partisans is concerned. The crushing defeat of Gates by Cornwallis in August 1780, at Camden, S. C., seemed to promise Cornwallis the control of the whole State and a threatening position towards North Carolina, but the American victory at King's Mountain in October 1780, served to keep him close to territory controlled from the sea. Greene now succeeded Gates in command of the American army and after King's Mountain and the battle of the Cowpens had largely deprived Cornwallis of his light troops, succeeded in drawing him away from the coast and northeastward across North Carolina almost to the Virginia line. Here, at Guilford Court House, in March 1781, in an action which was tactically a defeat for the Americans, Cornwallis was so weakened that more thorough invasion of the Carolinas became impossible. He retired first to Wilmington on the coast and then, as it became evident that Greene was returning southwestward again, crowding the British back to the coast at Charleston and Savannah, himself turned away and joined Arnold in Virginia in May.

The French Alliance now supplied, for the first time in an effectual manner, that indispensable element in the American defense, lack of which had prevented development of its more aggressive possibilities — viz. control of access by the sea. The threat upon New York by the French fleet and the forward movement by the American force drew off strength from Cornwallis in Virginia and kept Clinton close in New York till the strength of Washington's and Rochambeau's force was far on its way to Virginia. In the meantime, De Grasse's seizure of the entrance to Chesapeake Bay and the five days' action with the relieving British fleet off the entrance isolated Cornwallis, now entrenched on the peninsula between the York and the James Rivers, for a long enough period to allow of the complete investment of his position by superior numbers in front and the French fleet in his rear. Having exhausted the resources of such a position before the English fleet could appear again, Cornwallis surrendered 19 Oct. 1781. It is worthy of note that this was the first failure of the British seapower on the coast during the war and the thoroughness with which this first opportunity was exploited for purposes of aggressive defense indicates the grasp of the situation as a whole and the cautious daring which characterized Washington's strategy. The British were now in possession only of the ports of New York, Charleston and Savannah, and by reason of the moral effect of the capture of Cornwallis the war was practically at an end.

The decisive battles may be selected as follows: Bunker Hill, 17 June 1776, which inspired the British commanders with a firm notion of the inexpediency of a front attack on American forces behind breastworks; Long Island, 27 Aug. 1776, which gave the British the control of the mouth of the Hudson; Saratoga, 17 Oct. 1777, which frustrated the attempt to break the confederacy in two and which brought the French Alliance; King's Mountain, October 1780, and the Cowpens, 17 Jan. 1781, which deprived Cornwallis of his light troops in his overrunning of the Carolinas, and the naval action at the entrance of Chesapeake Bay, in the early part of September 1781, which made the siege of Yorktown possible.

Bibliography.— Fiske, 'The American Revolution'; Trevelyan, 'The American Revolution'; Lecky, 'History of England in the Eighteenth Century,' Vols. III. and IV.: Doyle, Chap. VII. in 'Cambridge Modern History,' Vol. VII.; Bancroft, 'History of the United States' (Author's last revision), Vols. IV. and V.; Winsor, 'Narrative and Critical History,' Vol. VI.

CHARLES WORTHEN SPENCER,
Professor of History, Colgate University.

4. United States — The Declaration of Independence. On 10 June 1776, the Continental Congress appointed a committee to draft a

Declaration of Independence. (See DECLARATION OF INDEPENDENCE.) Jefferson, the most radical theorist on this committee, wrote out a rough draft of the Declaration. This was carefully revised by the committee and reported to Congress on 28 June. After further revision by that body it was adopted on 4 July, and after being engrossed was signed on 2 Aug. 1776, by the members of Congress then present. The contents of the document fell under four heads: (1) the preamble, (2) theories of government, (3) an enumeration of a "long train of abuses," and (4) the resolution declaring independence. Of these the second and third portions are the most important. The philosophical doctrines underlying the Declaration as well as the phraseology in which they were given expression were not new. The document was simply the embodiment of ideas which had been prevalent for many centuries and which had crystallized into the systems of political philosophy of the 16th, 17th and 18th centuries. Jefferson had borrowed the ideas and even the language of Locke. The latter had found predecessors in Hobbes and Hooker. Hooker, a churchman, was simply giving expression to ideas which had been prevalent among church writers during the religious wars in France, the struggles concerning the powers of church councils in the 15th century, the strife between Louis of Bavaria and the popes of the 14th century and the investiture controversy of the Hildebrandine epoch in the 11th century. For the introduction of the ideas to churchmen probably no one was more responsible than Saint Augustine (354–430 A.D.).

The five fundamental theories of the Declaration are: (1) The doctrine of equality — "all men are created equal"; (2) the doctrine of inalienable rights; (3) that the origin of government was in a conscious act or compact — "governments are instituted"; (4) that powers of government rest on the consent of the governed; (5) the right to throw off government, that is, the right of revolution or resistance. The compact theory of the origin of government is first found in the theories of Protagoras and the Sophists (481–411 B.C.). The Stoics at the time of Zeno (308 B.C.) brought forward the doctrine of the common brotherhood and equality of men. Cicero (106–43 B.C.) gave expression to the theory that all men in a state of nature have certain equal rights. The Roman jurists of the Empire declared that though the will of the prince had the force of law, it had such only because the prince's power was conferred on him by the people. This idea was expressed more definitely by Saint Augustine when he said that government rested on a general pact of human society to obey kings — in other words, that government rested on the consent of the governed. The theory of resistance to the mandates of a ruler was given expression to by Socrates (469–399 B.C.) and the Apostle Peter, but Saint Augustine was the first to give unqualified approval of it in a general statement. He said that it was not always bad not to obey a law, for when the ruler makes one which is contrary to God, hence to divine and natural law, then it is not to be obeyed. Augustine thus contributed the idea of resistance to a law contrary to natural rights, while the jurists had merely stated that laws should not be contrary to natural rights. They had not advocated resistance.

The five fundamental philosophical theories of the Declaration were, therefore, in existence by the time of Saint Augustine. They were used separately or together throughout the middle ages. The struggles between the temporal and spiritual powers of the time — the Empire and the Papacy — gave excellent opportunities for their use. This is especially true of the fight which broke out between Henry IV. of Germany and Pope Gregory VII. (1073–1085). If the popes could get a general acceptance of the above theories, the power and pretensions of the temporal rulers would be thoroughly undermined. It was natural, therefore, that in the works of those church writers who supported the popes frequent expression should be given to just such doctrines as those which later found place in the Declaration of Independence. The theories of Manegold von Lautenbach (1081), a participant in the above struggle on the side of the pope, will serve as an example. He declared that the state was the mere work of man. Kingship does not exist by nature or by merit. Even the word king is a mere word of office. The power which he has was given him by the people. They did not exalt him above themselves so as to concede to him the free faculty of exercising tyranny, but they exalted him so that he should defend them from tyranny and interference by others. The people established government for mutual protection. They made a compact with the king and chose him king that he might force evil men to obedience and defend the good from the bad. If he falls into tyranny himself, the people are freed from his dominion and from subjection to him. As you would dismiss a swine-herd for not taking care of his herd, so must you with better and more just reason remove a king. Similar expressions of some or all of the doctrines are to be found in Gratian's codification of the canon law, in the writings of Peter Lombard, Alexander of Hales, Saint Bonaventura, Saint Thomas Aquinas, Engelbert von Volkersdorf, Marsiglio of Padua, William of Occam, Wiclif and others. Nikolaus Cusa (1401–1464) may be said to have been the first writer who combined the various theories into a systematic whole. "Since all men," he says, "are by nature free, then government rests on the consent of the governed"; and so he proceeds, deriving one doctrine from another. The connection of Cusa and the men before him with Hooker, Hobbes, Locke and Jefferson is to be found in the writings of such authors as Languet and others who wrote during the Wars of Religion in France. Undoubtedly all of these writers, including even the makers of the Declaration, firmly believed in the doctrines to which they gave expression. The fact that they used their theories for political or partisan purposes does not warrant the opinion that they did not believe in them. The doctrines no doubt had their origin in man's ideals of what should be and in that sense are purely philosophical in their character. The attempt to give them a historical foundation proved successful so long as scientific historical and legal studies were in a backward state, but during the course of the 19th century, the historical foundation for the doctrines received scant consideration from the hands of publicists

and students of history. Notwithstanding the unhistorical character of the principles of government embodied in the second portion of the Declaration, their influence has been enormous, and the world at large clings to them as if they had a historical origin in a primitive state of nature.

The third portion of the Declaration like the first is based on precedents. The enumeration of the "long train of abuses" is similar to the Grand Remonstrance of Parliament in the reign of Charles I. The list of abuses really forms a history of the relations between the English king and the colonies during the second and third quarters of the 18th century. The actions of the king are held to be in violation of rights which Englishmen had embodied in such documents as the Magna Charta, the Petition of Right, the Bill of Rights and the Act of Settlement. As Englishmen the colonists regarded themselves as entitled to the rights of Englishmen. They did not share the belief prevalent in England that the inhabitants of colonies were to be treated somewhat differently from Englishmen who stayed at home. Their ancestors had left England when English ideas of representation in Parliament were undergoing a change during the control of Long Parliament and Cromwell. In the new land of America they developed theories and customs of representation essentially different from those restored by Charles II. Englishmen at home might feel that they were represented by Parliament whether they voted for any one of its members or not, but in the colonies the idea had grown that a representative in a legislative body only represented the men who had a voice in his selection and who lived in the territorial district from which he was chosen. So to the colonists "the imposing of taxes without our consent" meant one thing, while to Englishmen it meant another. The other grievances enumerated, such as the deprival of the benefits of trial by jury and the quartering of armed troops among the colonists, undoubtedly played an important part in bringing about the War of the American Revolution, but probably no one thing contributed so much to the opening of that war as the feeling expressed in the phrase "the imposing of taxes without our consent."

Bibliography.— Channing and Hart, 'Guide to the Study of American History'; Dunning, 'Political Theories'; Willoughby, 'Political Theories'; 'Nature of the State'; Merriam, 'American Political Theories'; Sullivan, 'Antecedents of the Declaration of Independence,' in American Historical Association 'Proceedings,' 1903.

JAMES SULLIVAN, PH.D.,
Professor of History, High School of Commerce, New York.

5. United States — The American Revolution (Diplomatic Conditions during the War and the Peace Negotiations). Attempts to enter into relations in some form with foreign powers are to be found in the very early stages of the existence of the United States. In November 1775 Congress appointed a committee to correspond with friends in other parts of the world, and this committee very soon came into communication with agents of the French Government, sent to observe conditions in the colonies. Early in 1776 this committee appointed Silas Deane as their agent to go to France for the purpose of obtaining military supplies and by the last of July he had been admitted to an interview with Vergennes, the Minister for Foreign Affairs, and had been put into connection with Beaumarchais, through whom, with the connivance of the government, important supplies of war were furnished. Deane had been instructed to inform Vergennes that France had been selected as the first power to whom this application should be made "from an opinion that if we should . . . come to a total separation from Great Britain, France would be looked upon as the power whose friendship it would be fittest for us to cultivate." After the Declaration of Independence, France and Spain, as powers most unfriendly to England, were still courted with the greatest diligence, but ministers or plenipotentiaries were also commissioned from time to time to the other courts on the Continent. From none but France and Holland, however, was recognition obtained, and from only these two was any official aid or countenance given before the conclusion of peace. Holland's recognition was extended just before the completion of the peace negotiations, and Spain, though refusing to recognize the United States, in the early days of the struggle, afforded a limited amount of financial assistance. In many regions of Europe among the people, and at several of the courts, there was a disposition friendly to the American cause, but in no case was this disposition serious enough for practical purposes to lead the governments away from the path of strict neutrality, except in the limited way afforded by the Armed Neutrality.

From the first, the French government had taken great interest in the colonial revolt and, before the arrival of Deane, had determined for the present to remain nominally at peace with England, but to assist the revolt surreptitiously with just enough energy to keep both sides actively and, if possible, exhaustingly, occupied. In this policy the Spanish government joined, and between the two governments two million livres were placed at the disposal of the insurgents in the summer of 1776. In September 1776 Congress adopted a general plan for treaties to be proposed to foreign powers, and joined Franklin and Arthur Lee with Deane as commissioners to lay such a treaty before the French government. The coming of Franklin increased the general popularity of the American cause, but the government was not disposed to change its attitude for the relations of the proposed treaty, which was concerned largely with commercial relations and provided for no political alliance. Apparently Congress' appreciation of the need for foreign aid grew stronger after the British capture of the mouth of the Hudson, and shortly after the meeting of the commissioners in Paris they were instructed to abandon the commercial basis of the proposed treaty and to propose to France and Spain a political connection, offering assistance to France in conquest of the West Indies, and to Spain in the subjugation of Portugal. Little substantial progress was made, however, in this direction till December 1777, when news was received of the surrender of Burgoyne's army at Saratoga. This signal achievement of the Americans entirely changed the face of affairs by convincing France of the probability of ultimate American success,

and within a few days of the receipt of the news, the commissioners were informed, in reply to their peremptory inquiry as to the intentions of the government, that the king was determined to acknowledge the independence of the United States and to enter into treaty relations in support of that independence. Accordingly, on 6 Feb. 1778, two treaties, one of commerce, on the most-favored-nation principle, and one of alliance, which provided for an intimate political association of the two countries, were signed. The treaty of alliance, which was very different from the original American proposals, stated the object of the alliance to be the maintenance of the sovereignty and independence of the United States in government as well as in commerce, provided for mutual aid in case of war between France and Great Britain, agreeing that territory reduced by the United States in the northern part of North America and in the Bermudas should belong to the United States, and that conquests in the West Indies should belong to the King of France, stipulated especially that neither party should conclude peace with Great Britain without the formal consent of the other first obtained, and provided for the continuance of the war with Great Britain till formal or tacit recognition of the independence of the United States by the treaties ending the war. Articles XI. and XII. provided for a mutual and perpetual guarantee of possessions in the western hemisphere, which was to give serious trouble in the subsequent relations between the two States. Whatever the sentiments of the French people, the French government entered into this relation, as was plainly stated in the announcement to the commissioners of the king's determination to recognize the new state, from no purely disinterested motives in favor of the Americans, but on the ground that it was manifestly to the interest of France that the power of England be diminished by the separation of the colonies. The popular sentiment for the American cause simply co-operated with Vergennes' aggressive designs on England in opposition to the more prudent suggestions within the government as to the ruinous effect of such an expensive enterprise upon French finances.

Since the Family Compact between the Bourbon kingdoms in 1761, the relations of France and Spain in all matters of external policy had been of the closest alliance, and the French-American treaty of 1778 contained a clause providing for the accession of the King of Spain to its terms. Nevertheless Spain found the general spirit and the precise terms of this alliance not at all to her liking, and announced to England that she held herself free from any such engagement, and proceeded to offer mediation on terms which would leave England in possession of the Saint Lawrence Valley and the territory northwest of the Ohio, and herself in possession of everything west of the Alleghanies and south of the Ohio. On the refusal of the British government to accede to such mediation, Spain at length, on 12 April 1779, allowed herself to be urged into war with France against Great Britain, but expressly refrained therein from alliance with, or recognition of, American independence. In the meantime, Luzerne, the French minister to the United States, was trying to persuade Congress that Spain's price for an alliance with the United States, namely, the Floridas and exclusive navigation of the Mississippi, was not too high, and that the accession of Spain to the alliance would be likely to bring about peace speedily. In September of the same year Jay was sent as United States minister to Spain, with instructions to the purport that if Spain would accede to the treaties with France she should not be precluded from receiving the Floridas, and that if she should wrest them from Great Britain, the United States would guarantee them to her, provided that the United States should enjoy the free navigation of the Mississippi, and this proviso was laid down as an ultimatum. Jay was further instructed to secure a port on the Mississippi below the 31st parallel. Jay's mission was entirely unsuccessful, even after the change of his instructions, which abated the American claim to navigation of the Mississippi as an ultimatum.

In the meantime, in preparation for any opening that might develop, Congress had been preparing instructions for a commissioner to participate in negotiations for a general peace. In addition to recognition of independence, boundaries, substantially such as actually were finally adopted, the Newfoundland fisheries, free navigation of the Mississippi, with a port below the 31st parallel were laid down, at first, as ultimata, with John Adams, appointed as sole commissioner. But in 1781, under the influence of Luzerne, these instructions were revised, by referring to the claims therein indicated as expressing the desires and expectations of Congress, but by leaving the commissioners at liberty to secure the interests of the United States as circumstances might direct and enjoining them to undertake no negotiations for peace without the knowledge and concurrence of the French ministers, and ultimately to be governed by their advice and opinion. Franklin, Jay, Laurens, and Jefferson were joined with Adams as commissioners.

The news of Cornwallis' surrender had so strengthened the hands of the opposition in England that in March 1782 North resigned, and the recognition of American independence was made a condition of acceptance of office by Rockingham. In proceeding to negotiations, considerable difficulty was experienced over the matter of the relation between the recognition of independence and negotiation of other topics. For reasons of his own, Vergennes encouraged the American commissioners in holding out for unconditional acknowledgment as a prior condition to negotiation. In the meantime Jay and Adams became convinced that Vergennes would, for the sake of Spain, as well as in conformity with his own plans for America, oppose the American claims in the matter of the western boundaries and of the fisheries. In conscious disregard of their instructions, they independently suggested to Shelburne an arrangement which fully recognized independence before negotiation and at the same time allowed him to see that a majority of commissioners present in Paris were willing to proceed in negotiations with Great Britain separately from their ally. Shelburne immediately took advantage of the division of the allies, and with Franklin's reluctant consent, preliminary articles, exactly coincident with the treaty signed in connection with

the treaties of the other belligerents, were signed 30 Nov. 1782. The arrangement was then revealed to Vergennes, who, at first, indignant at the apparent bad faith, was pacified by Franklin's soothing explanations. As a matter of fact, both Frenchmen and Americans had scrupulously fulfilled the letter of their agreement in everything which had been exactly stipulated, and in other matters, each nation equally had acted in accordance with its own views of interest.

The definitive treaty, signed in connection with the treaties between Great Britain and the other belligerents 3 Sept. 1783, recognized in its first article the independence of the several thirteen States. The boundaries of the new nation were, on the west, the Mississippi River south to the 31st parallel; on the south, the 31st parallel from the Mississippi to the Chattahoochee, down that river to its junction with the Flint, thence in a straight line to the source of the Saint Mary's and thence to the sea; on the north, practically the line of the Lakes and the Saint Lawrence, leaving stretches at the northeast and northwest corners so indefinitely described that much trouble was experienced at these points in later times. Both countries were to have free navigation of the Mississippi. The United States was to enjoy the right of fishing at all places where the inhabitants of both countries used at any time heretofore to fish, and the liberty of drying and curing fish on lands, except Newfoundland, which were unsettled. Creditors on either side were to receive no impediment to the recovery of the full value of debts heretofore contracted. Congress was earnestly to recommend to the States to pass acts in relief of the Loyalists. Provision was made for bringing hostilities to a close. By a separate and secret article it was provided that if Great Britain should win back the Floridas from Spain, the southern boundary of the United States between the Mississippi and the Chattahoochee should be the parallel of 32 degrees and 30 minutes. The conclusion of this peace has been generally regarded as a remarkable achievement on the part of the American commissioners, and its successful outcome is to be attributed not only to the daring statesmanship which disregarded the instructions of Congress, but also to the influence of Franklin in France, and the skill with which appeal was made to the enlightened generosity of the sentiments of the ministry in power in Great Britain.

Bibliography.— Fiske, 'Critical Period of American History'; Lecky, 'History of England in the Eighteenth Century,' Vol. IV.; Biographies of Franklin, Jay, and Adams in 'American Statesmen Series'; Fitzmaurice, 'Life of Shelburne'; Winsor, 'Narrative and Critical History,' Vol. VII.; Wharton, 'The Revolutionary Diplomatic Correspondence'; Works of Franklin, John Adams, John Jay.

CHARLES WORTHEN SPENCER,
Professor of History, Colgate University.

6. United States — Articles of Confederation. On 10 June 1776, the Continental Congress appointed a committee to frame an instrument of government. This was entitled the "Articles of Confederation and Perpetual Union." (See CONFEDERATION, ARTICLES OF.) It was not until five years later (1 March 1781) that all of the States had finally signed it. The defects of this scheme of government were so numerous and serious that for a time it looked as if the Union would go to pieces. Under such circumstances attempts were made at various times to change the Articles in such a manner as to give more power to the central government in those matters in which it was most seriously hampered: the finances, commerce, and power to coerce the States. The first proposal to amend the Articles was made on 1 Feb. 1781, even before they went into effect. This was known as the Five Per Cent Amendment. Its avowed purpose was to give to Congress the power to levy a five per cent ad valorem tax on most articles imported and on all prizes taken on the high seas during the war. The proceeds of this tax were to go toward paying the principal and interest of the debt contracted during the war. Within a year 12 of the States had consented to the passage of this amendment, but Rhode Island refused. As the approval of *all* States was necessary for an amendment, this naturally failed. On 16 March 1781, Madison submitted a report of a committee which recommended giving to Congress the power to coerce the States to fulfil their federal engagements. This power was to be embodied in an additional article to the Articles of Confederation. This report was referred to a grand committee on 2 May 1781, and reported back by it on 20 July, of the same year. On its recommendation a new special committee of three was constituted to prepare an exposition of the Confederation, a plan for "its complete execution and supplemental articles." This committee reported on 22 August, and thought it ought to be discharged from the exposition of the Confederation because such a comment would be voluminous if co-extensive with the subject. The committee, nevertheless, made a report on the defects of the Articles of Confederation, and made strong recommendations that many supplemental powers be given to Congress. The committee further advocated that a committee be appointed to prepare representations to the several States of the necessity of these supplemental powers, and of pursuing, in the modification of the Articles, one uniform plan. These recommendations, however, came to naught. The matter of the defects of the Articles was taken up from the outside and on 26 Feb. 1783, Pelatiah Webster issued 'A Dissertation on the Political Union and Constitution of the Thirteen United States,' in which he advocated the adoption of very thoroughgoing changes in the Articles. He proposed to divide Congress into two bodies and to give it greater power over the States and over individuals. On 18 April 1783, a Revenue Amendment was introduced into Congress. The object of this was to obtain for Congress the power to levy specific duties on certain articles imported and a five per cent ad valorem duty on all other goods at the time and place of importation. The collectors of the duties were to be appointed by the various States, and after appointment were to be amenable to and removable by Congress. The proceeds from the duties were to be applied to the payment of the principal and interest of the debt. Under the same amendment the States were to make provision, during a term not longer than twenty-five years, for the collection and payment

of their proportion of the Federal expenses. In the same connection it was suggested that the basis for the calculation of such proportions be changed from the value of land in each State, as was prescribed in the eighth article of the Articles of Confederation, to the number of people in each State. Again twelve States approved of this amendment, but this time New York, having just worked out an elaborate scheme of duties for herself against the other States, refused to ratify it. Alexander Hamilton of New York drew up an elaborate exposition of the defects of the Articles, and on 3 June 1783, intended to present it to Congress along with a resolution calling for a general convention to revise the Articles, but he abandoned his project for want of support. On 30 April 1784, another amendment was recommended by Congress. This time Congress asked to have given to it for a period of 15 years the power of forbidding trade with foreign powers having no treaty of commerce with the United States and of prohibiting the citizens of any foreign state from importing into the United States any articles which were not the produce or manufacture of that State. This proposal, so essential in its essence for the government of every country to have in that age of restricted trade, was ratified by only two States, and therefore failed of adoption. In 1785, another man outside the halls of Congress, Noah Webster, put forth, in his work entitled 'Sketches of American Policy,' suggestions for the improvement of the Articles. Like many other men of the time he recommended a strong executive and giving to Congress the power to coerce the States. About the same time James Monroe introduced in Congress a proposition to change article nine of the Articles in such a way as to give Congress the power to place retaliatory duties on the products of foreign States that discriminated against the United States. The proceeds of such duties, however, were not to go to the Federal government, but were to go to the State in which they were collected. This proposition was referred on 28 March 1785, to a committee of which Monroe was chairman, and on 13 and 14 July of the same year was discussed in Congress, but no action was taken. A similar proposition to that of Monroe's was embodied in the report on trade and revenue presented to Congress by a grand committee on 14 Aug. 1786. Additional proposals in the same report recommended that the States which delayed to pay their proportions of the funds required for the running expenses of the federal government should have to pay fines in addition, that in States which made no provision for collecting the sums asked for Congress should have power to step in and order them collected by State officers and in case of necessity appoint officers or agents of its own to collect them, and that States offering resistance to Congress or its agents in making such collections should be considered as violating the Federal compact. Further provisions in this committee report gave Congress the power to introduce new systems of revenue and to make regulations for the finances, and if 11 of the States agreed to such systems or regulations, they were to become binding on all. In addition Congress was to be given the power to institute a court of seven members to try officials of the Federal government and to hear appeals from the State courts concerning the interpretation of treaties or regulations made by the Federal government. On the report of this grand committee Congress took no action. The longer the Confederation existed the more hopeless the chance for a strong central government became. From all sides came expressions of fear and alarm for the Union itself. As early as 1783 Washington, in a circular letter to the State governors, had expressed fear for the Union and declared that there must somewhere be lodged a supreme power to regulate and govern the general concern of the Confederated Republic, or it would go to pieces. Jay, in a letter to Washington in 1786, said: "I am uneasy and apprehensive, more so than during the war." From our former friends in Europe came the disquieting news that they no longer had confidence in our credit. Adams in trying to negotiate a loan in Holland in 1784 was met with expressions of distrust in the stability of the Union — a distrust which the London Gazettes did everything to encourage. As Congress had failed utterly in all attempts it had made to have the Articles amended, help had to come, if it came at all, from some other quarter. Congress had lost the respect of the country through no fault of its own. The most capable men had deserted its halls for those of the State legislatures. Everything seemed to point to a speedy dissolution of the Union as it existed under the Articles of Confederation, when aid came from an unexpected quarter and quite by accident. This was the Alexandria Convention, called to settle commercial disputes between Virginia and Maryland. From this grew the Constitutional Convention. The new Constitution (q.v.) drafted by that body was ratified by nine States and 4 March 1789 set for its inauguration. On 2 March 1789 the Congress of the Confederation adjourned *sine die*, and thus brought the government under the Articles of Confederation to an end.

Bibliography. — Bancroft, 'Constitution'; Fiske, 'Critical Period'; bibliography in Channing and Hart, 'Guide to the Study of American History.'

James Sullivan, Ph.D.,
Professor of History, High School of Commerce, New York.

7. United States — The Formation of State Constitutions. When the resistance to Great Britain first began, independence was not the aim, and in consequence only provisional governments were established, temporarily to take the place of the English colonial governments which had one by one succumbed or been suppressed. Provisional Congresses or Conventions in the several colonies assumed political control, intrusting the executive function to Committees of Correspondence and of Public Safety. Under these loose revolutionary organizations government was conducted for several months, but as it soon became evident that the contest was to be a prolonged one, there gradually arose a conviction that more regular and permanent forms of government should be ordained. The several colonies turned to the Continental Congress, representing all the colonies, for direction, and this body took the initiative in inaugurating the several State governments. Quite naturally, the first request came from the Provincial Congress of Massachusetts, as in

that colony hostilities already had broken out. On 16 May 1775 that body asked its "explicit advice respecting the taking up and exercising the powers of civil government." The Congress replied 9 June, recommending that they should call upon the several towns entitled to representation in the assembly to elect members, and the assembly so chosen should select a council, the two bodies should govern in approximate conformity to the spirit and substance of the colonial charter, until a governor of his majesty's appointment should consent to govern according to that instrument. This advice was promptly followed and the government so organized remained in force until 1780, when the first constitution of that State was established. A few months later New Hampshire, South Carolina and Virginia successively sought guidance with respect to the establishment of their civil governments, and by November Congress advised them respectively "to call a full and free representation of the people" that they may adopt "such a form of government as in their judgment would best promote the happiness of the people and most effectively secure peace and good order in the province during the continuance of the dispute with Great Britain." Finally as the movement in favor of independence gained adherents, Congress 10 May, in anticipation of the Declaration of Independence, recommended that the colonies that had not already done so should establish regularly ordained governments. In consequence of this advice, the colonies, each soon claiming to be of right a free, sovereign and independent State, were shortly inaugurating their first State constitutions.

New Hampshire's constitution was completed 5 Jan. 1776, to be followed by South Carolina on 26 March. Both of these constitutions were incomplete and unsatisfactory, and proved but temporary, as they were replaced by new ones within a few years. Rhode Island and Connecticut retained their colonial charters. The former simply discharged its people from their allegiance to the king by act of the Legislature of 4 May, the latter provisionally effected a similar change 14 June, which it made permanent by act of 10 October, at the same time enacting a short bill of rights. Virginia adopted its constitution 29 June, and New Jersey's was proclaimed on 3 July. Thus before the Declaration of Independence seven States had assumed independent governments, and four had drawn up written constitutions. Four other States followed in the same year, Delaware, 21 September; Pennsylvania, 28 September; Maryland, 11 November, and North Carolina, 18 December. In the year 1777 Georgia adopted a constitution on 5 February, and New York did likewise on 20 April. South Carolina's second constitution was promulgated 19 March 1778. Massachusetts continued under its provisional government until 16 June 1780, when its constitution went into force. New Hampshire finally secured a new frame of government, 2 June 1784. Vermont, although unrecognized by the other States, pursued her own independent course, framing two constitutions during this period, those of 1777 and 1786. The first was largely copied from that of Pennsylvania. No other State constitutions were adopted prior to the ratification of the Federal Constitution.

The compact theory, especially as put forth by John Locke in justification of the English Revolution of 1688, was generally accepted in America by the constitution makers of the Revolutionary period. Its principles as explicitly set forth not only in the Declaration of Independence, but in all the State constitutions as well, were that the people have the natural right to abolish or alter their form of government when in their judgment it has become destructive of their rights. Seven of the constitutions expressly declare that their former relations are dissolved because the king had violated the compact. This served as the basis for the legal defense of their action. Sovereignty, it was commonly held, rested in the people, and from them alone emanated the power to inaugurate a new form of government. But in practice they departed somewhat from this theory. Although in most of the States the people were consulted through their choice of representatives to a provincial convention, which should draft a frame of government, there were several exceptions, as in the case of both the constitutions of South Carolina. Neither was the Virginia Provincial Convention, nor the New Jersey Congress specifically empowered to frame a constitution, but each assumed that they were authorized to act in accordance with the advice of Congress. Again in the framing of the early revolutionary constitutions that careful distinction that came later to be made between a legislative body and a constitutional convention was not observed. Owing to the exigency of the times, the Provincial Congress or Convention in each of the States that framed constitutions during the years 1776 and 1777, with one exception, acted not only in the capacity of a constitutional convention, but also assumed the powers of legislation and administration. The one exception was in the State of Delaware, where a convention not only was chosen for the express purpose of framing a constitution, but dissolved upon the completion of that work. None of these constitutions was submitted to the voters for their approval, but went into operation at once upon their adoption by the convention. The first State to inaugurate the practice of seeking the sanction of the people upon the work of the convention was Massachusetts in 1778. In that year a constitution, which had been drawn by a convention elected for the sole and express purpose of framing a fundamental law, was submitted to the voters for their approval and was rejected. Two years later a constitution similarly framed was adopted by the people of Massachusetts. This practice was followed by New Hampshire in the inauguration of its second constitution in 1784.

The State constitutions reveal the continuity in the development of American political institutions. They have been called by Bryce "the oldest things in the political history of America, for they are the continuations and representations of the colonial charters." It is in the colonial charters, especially in the corporate colonies, that we find their prototype. These documents served as the written constitutions of the respective colonies, according to which they were governed. So liberal were those granted to Connecticut and Rhode Island that they served these States respectively until well into the 19th century. But in addition to the charters there were other elements that entered into the State constitutions. The colonists had a century and a half of experience to draw upon, during which

their governments had undergone great development and many new features both written and unwritten had been added to their fundamental law. Moreover, at the basis of all their legal ideas was the English constitution and the common law, both of which profoundly and perhaps unconsciously, influenced them. They also accepted the prevailing political philosophy of the age, as above indicated—which was derived chiefly from English sources, although no one writer exerted a greater influence upon them than Montesquieu (q.v.) through his "Spirit of Laws." Speaking generally "the first State constitutions were little more than the pre-existing colonial constitutions adapted to the changed circumstances."

The main features of the constitution consisted of the Bill of Rights (q.v.),—in some introduced by a preamble,—and the constitution proper. Eight of the instruments of this period, if we include Vermont, were prefaced by bills or declarations of rights, and in the other constitutions there were important provisions of this character. The first of these was adopted by Virginia, and was drafted by George Mason. To a considerable extent it served as a model for the other States. In all the bills of rights there were some one hundred different provisions. They were a statement of what Americans regarded as the inherent rights of man. While doubtless suggested by the English Bill of Rights, they were much more comprehensive and explicit than their English prototype, and deal much more with the rights of the individual. Thus typical provisions are the declaration that "all men are born free and equal," and are to be protected in their personal and property rights. Freedom of religion, freedom of speech, the right to bear arms and of trial by jury are all carefully guarded. Similarly the freedom of the press, freedom of election, the right of assembly and of petition are guaranteed. Excessive bail and fines, cruel and unusual punishments, unwarranted search and seizures, the quartering of troops in times of peace are all prohibited. The granting of titles of nobility, hereditary honors or exclusive privileges are forbidden. All of these are principles that have been accepted as essential to the perpetuity of a democratic republic.

All the constitutions recognized the principle of the threefold separation of powers, and provided for the establishment of distinct legislative, executive and judicial departments. Not only had the experience of the Colonial period tended toward the differentiation of these three departments, but its importance had been emphasized by Montesquieu. Some of these instruments explicitly declared, as that of Massachusetts, that no one of the departments should ever exercise any of the powers of the other two, but in practice this principle was frequently not observed. In the organization of the legislative department all the States except two made provision for the bicameral system which had been developed during the colonial times. Pennsylvania and Georgia were the exceptions. They retained their single house. The lower branch was the more popular and numerous, the Senate, as the upper house was most frequently styled, being not more than one third or one fourth its size. Representatives were variously apportioned, not in general according to the population, but the local divisions of the town in New England and of the county elsewhere served as the basis of representation. Old inequalities were continued and in some instances new ones were introduced. For the Senate the same unit of representation served as for the House in four States, but special senatorial districts were created in others. The members of the lower house were elected annually except in South Carolina, where the term was two years. In the majority of the States the term for the upper branch was also one year, but in four it varied from three to five years. In all of the States save three the members of both houses were elected directly by the qualified voters, but by the first constitutions of New Hampshire and South Carolina the members of the upper house were chosen by the lower out of their number and in Maryland there was a senatorial electoral college. A freehold or property qualification was required in all the States for membership in either branch, and also for the executive, except in Pennsylvania, where the payment of a poll tax was sufficient. In addition to a higher age and residence requirement for senators, a larger property qualification was usually called for, as the Senate was supposed to represent property. Thus in New Hampshire a senator must possess a freehold of £200, the governor £500; in South Carolina £2,000 and £10,000 for the respective offices. In addition religious qualifications were required by all the States for governor and members of the legislature, except New York and Virginia. The usual one was that the member must be a Protestant, in two a Christian, but in four a believer in the inspiration of the Scriptures, and in Delaware of the doctrine of the Trinity as well. In the organization of the executive department all the constitutions, except two, made provision for a single executive, who was usually called the governor. By the first constitution of New Hampshire there was no provision for a distinct executive. In Pennsylvania an executive board was established. In only three States was the executive elected by the people, in the others he was chosen by the legislature. His term of office was usually one year, but in two middle States it was three years and in South Carolina two. In nearly all the States an executive council, elected by the legislature, was associated with the governor. This body inherited the advisory and administrative functions of the old colonial council. It was to act as a check upon the governor, sharing with him the exercise of those few powers that had not been already vested in the legislature.

A comparison of the powers conferred upon the legislative and the executive departments reveals the fact that the constitution makers were very much influenced by their colonial experience. They were mindful of the recent contests between the royal and proprietary governors and the legislatures. This led them to fear executive usurpation, while it gave them great confidence in the legislature, which had boldly championed the rights of the people. Accordingly almost unlimited powers were conferred upon the legislature, while the governor was deprived of nearly all the customary powers of the colonial executive. He was entrusted with a qualified veto in Massachusetts alone. The appointing power was exercised by the legislature in five of the States, in several they chose the more important officers, while in a few the governor was allowed to share this power with the coun-

cil. As commander of the military and naval forces of the State the governor presents a more imposing figure than as a civil officer. On the other hand, save for the provisions in the Bill of Rights, almost no limitations were placed upon the powers of the legislature. In addition to strictly legislative power it exercised also important administrative functions, as previously indicated. In several States the upper house possessed certain judicial powers which were brought over from the colonial council, and suggest similar functions of the House of Lords, as the trial of impeachments, and in a few cases it acted as a court of last resort.

The judicial system of the colonies was in general retained under the State governments. While differing in particulars there was a similarity in the organization of this department in all the States. Many of the details were left for statutory enactment. The chief provisions in the constitution, related to the method of appointment and removal and the tenure of office of the judges. In Georgia alone the judges, with the exception of the chief justice, were elected by the voters. Elsewhere they were appointed, in about half the States by the legislature, in the others by the governor and council. The usual tenure of the supreme court judges was for good behavior, but in most of the States they were removable. In all the States their salary was fixed by the legislature. The judiciary lacked security and independence owing to its dependence upon the legislature, but fortunately in general that body refrained from interfering with the freedom of the courts.

Property qualifications were prescribed for the exercise of the suffrage in all the 13 States either in the constitution or by law. These varied from the requirement that the elector should be a taxpayer to that of the possession of freehold of the value of £100. In a few States a larger amount was required for the electors of senators than for representatives. In South Carolina the suffrage was further restricted to those who believed in God and in a future state of rewards and punishments. As a result of these provisions the majority of white men were unable to vote. Although freedom of religion was proclaimed in almost every constitution, in several there was a close connection between church and state. In addition to the religious qualifications for office holding already referred to, the legislature was empowered in two New England States to require the support of Protestant clergy at public expense, and in Maryland of the Christian religion. South Carolina declared the Christian Protestant religion to be the established religion. Provision was made for amendment in eight of these constitutions. Five under various restrictions reserved this power to conventions. Three gave the amending power to the legislature, but under such restrictions as a vote by two successive legislatures or requiring a larger majority than for ordinary legislation; in the remainder there was no provision for amendment, thus leaving the power in the complete control of the legislature.

Space does not permit the further analysis of these documents. It should, however, be noted that the later constitutions, as those of New York and Massachusetts, were more complete and more carefully drawn than the earlier ones, their framers profiting from the experience of the other States. All of these constitutions, while republican, were not democratic in character, as judged by later standards. The religious and property qualification, so characteristic of 18th century ideas, gradually disappeared with the advance of the new century, and the chief defects of these instruments, the excessive power placed in the hands of the legislature and the weakness of the executive, were in time corrected. So conservative, however, were some of the original States, and so well adapted were these constitutions to serve the purpose for which they were designed, that five of them, although amended, were not superseded for more than a half-century, and one, that of Massachusetts, is still in force.

The period from 1776 to 1780, it has been truly said, is "the most eventful constitution-making epoch in our history." It marks the transition from colonial to commonwealth governments. Moreover just as these constitutions were largely based upon the organic law of the colonies, so in turn they served as models and furnished the chief features for the Federal Constitution. In addition, Judge Jameson has pointed out that from the revolutionary conventions of the earlier part of this period, there developed before its close that peculiarly American institution, the constitutional convention,— such as the ones held in Massachusetts and New Hampshire,— which in subsequent years was accepted as the all important organ for framing the State constitutions. The method these two States employed in drafting their constitutions through a constitutional convention, and its subsequent submission to the voters for their approval came to be the normal practice followed in the other States in ordaining their organic law. See CONSTITUTION; GOVERNMENT.

Bibliography.— Poore, 'Charters and Constitutions' (1878); 'Journals of Congress,' I. (105, 108, 215, 219); II. (158, 166), (1800); Jameson, 'A Treatise on Constitutional Conventions' (1887); Jellinek, 'The Declaration of the Rights of Man and of Citizens' (1901); Thorpe, 'A Constitutional History of the American People' (1898); Webster, 'A Comparative Study of the State Constitutions of the American Revolution' — 'Annals of the American Academy of Political and Social Science'; Bancroft, 'History of the United States' (V. ch. IX.); Hildreth, 'The History of the United States' (III., 374); Borgeaud, 'Adoption and Amendment of Constitutions in Europe and America' (1895); Cushing, 'Transition from Provincial to Commonwealth Government in Massachusetts'; articles on several State constitutions in 'Political Science Quarterly' (III., 489, X., 426); and in 'Johns Hopkins University Studies in Historical and Political Science' (XIII., 481; XVI., 477).

HERMAN V. AMES,
Professor of History, University of Pennsylvania.

8. United States — The Peopling of the. During the first 60 years of the 17th century a substantial beginning of the permanent colonization of the Atlantic seaboard had been made. In this work the English, Dutch, and Swedes each played a part, but the chief role had been taken by the English. Their colonization efforts, at first chiefly prompted by commercial reasons, were feeble. The Virginia colony,

established in 1607, owing to ignorance, the blundering methods followed, and the hardships encountered increased very slowly. In spite of successive reinforcements and the introduction of the family system its population amounted to only about 3,000 after more than 20 years. The religious and political situation in England was more effective in stimulating colonization than commercial inducements had been. The pioneers of the religious refugees, the Pilgrims, who settled at Plymouth in 1620, after 10 years numbered only some 300. But the triumph of absolutism in church and state led to the great "Puritan Exodus" to New England. During the 11 years that Charles I. reigned without a Parliament, 1629 to 1640, some 21,000 immigrants came out. With the outbreak of the civil war in England, however, this emigration ceased. In the meantime there had been a small immigration to Maryland, which had been founded in 1634, consisting of some English Catholics, but more Protestants, and a constant flow of colonists to Virginia, a considerable proportion of which was of the poorer class. A report of 1638 states that "scarcely any came but those who are brought in as merchandise to make sale of." By 1640 its population was estimated at 7,500. However, the triumph of the Parliamentary forces caused a great Cavalier movement to Virginia, which not only doubled its population in 10 years, but also markedly raised the character and prosperity of the inhabitants. By 1660 the total population of the English colonies is believed to have been upward of 80,000, about equally divided between New England and the two southern colonies.

Meanwhile in the middle region, lying between the two groups of English colonies, the Dutch and the Swedes had planted settlements. The former had taken possession of the Hudson valley and the western part of Long Island, the latter had a foothold on the banks of the Delaware. The Swedish colonists were never numerous and after 17 years of precarious existence in 1655 their small settlements of 200 or 300 souls passed into the control of the Dutch. The Dutch, more prosperous and populous than the Swedes were much less so than their English neighbors, owing to the narrow policy of the Dutch West India Company, but by 1664 New Netherland had reached a population of 7,000. This, however, was not exclusively Dutch, for even at that early date the future metropolis was a cosmopolitan city. Some 18 different languages were said to have been spoken in New Amsterdam in 1643, and the English had overrun a considerable part of Long Island. The English government, shortly after the Restoration, jealous of the Dutch, decided to wrest the middle region from them. This was accomplished in 1664, and while the Dutch population long remained an important element in New York the Anglicizing process at once began. During the period between the Restoration and the English Revolution of 1689 a few colonists came to New England, more to Virginia and Maryland and a beginning of the colonization of the Carolinas was made, but the greatest immigration was to the middle colonies. East and West Jersey were settled — the former by English direct from England or from the Puritan colony of New Haven, the latter by the English Quakers,— and the "Holy Experiment" in Pennsylvania had made a most prosperous beginning, with its English and Welsh Quakers and a few Germans, the forerunners of the great 18th century migration. By the close of this period the middle colonies numbered about 40,000 inhabitants, or about half as many as New England, while the total population of all the English colonies is believed to have been about 200,000, and by 1700 is estimated by De Bow as 262,000.

During the 17th century the colonists were largely English, but in the 18th century the immigrants were chiefly of other races, nearly all the countries of northwestern and central Europe being represented. Already an important and valuable, although not large French element had been introduced into the population, through the coming of the Huguenots, who, especially in the years following the Revocation of the Edict of Nantes (1685), found their way into nearly all the colonies, but were especially numerous in South Carolina and New York. A number of their descendants became prominent during the Revolutionary period. A few Germans seem to have come to America with the Swedish and Dutch settlements, but it was not until the founding of Pennsylvania that any considerable numbers arrived. Their migration has been divided into three well-defined periods. The first from 1683 to about 1709, during which there was a small immigration into Pennsylvania of perhaps a few score a year, of certain religious sects, chiefly Mennonites. The second period, 1709–27, opens with the coming of the Palatines, thousands of whom, in consequence of the ravaging of the Palatinate by war and the prevailing religious and economic tyranny, had taken refuge in England in 1709 with the hope of being aided to America. Queen Anne's government sent some of them to the Carolinas but more than 3,000 were transported to New York, where most of them in a few years settled in the Mohawk and Schoharie valleys, but a few hundred dissatisfied with their treatment eventually found their way into Pennsylvania. About 1710 Swiss Mennonites and Palatines began to come directly to Pennsylvania, followed by Dunkers and various other sects. By the close of the second period a conservative investigator places the number of Germans in this colony alone as between 15,000 and 20,000. During the third period, 1727 to 1775, the number of immigrants reached enormous proportions. While a few hundred Germans and Swiss found their way directly to some of the southern colonies, especially to the Carolinas and Georgia, by far the greater number came to Pennsylvania. A careful estimate by Kuhns of the number passing through the port of Philadelphia, based upon the lists of arrivals during this period, gives an aggregate of nearly 70,000. Almost one half of these fall within the six years, 1749 to 1754. So numerous were the German immigrants that the English and colonial authorities were at times alarmed for the safety of the colony. As will be noted later many of the Germans found their way subsequently to other colonies, but the majority of the authorities agree that in 1775 they comprised about one third of the total population of Pennsylvania, or about 100,000. Most of these later immigrants did not come for religious reasons, as was the case with the sectaries of the earlier periods, but they were chiefly of the peasant

class, who were seeking relief from the burdens of feudalism. They were an honest, industrious, simple and deeply religious people. Content with their new found prosperity they took little part in colonial politics. Settling together they largely comprised the population of certain counties. So conservative were they and tenacious of their customs and language, that whole communities of their descendants to-day speak a dialect commonly known as Pennsylvania Dutch.

Another equally important non-English element introduced into the colonial population was that of the Scotch-Irish, or better, the Scotch Presbyterians from Ulster, Ireland. Here their ancestors had made their homes for two or three generations, but driven by the religious bigotry of the established church, the commercial jealousy of England and the oppression of the landlords, they now sought a refuge across the sea. The emigration began about the opening of the 18th century, but assumed considerable proportion by 1718. It is estimated that between 1725 and 1768 the number of emigrants rose from 3,000 to 6,000 annually. In consequence of the famine of 1740 it is said 12,000 left Ireland annually for several years for America. Doubtless many of these were pure Irish as well as Scotch-Irish. Between 1771 and 1773 some 30,000 departed. Froude says "that ships could not be found for the crowds that wanted to go." As a result of this emigration about one half of the Presbyterian population of Ulster came to America. Some of these went to New England, several thousand sailed directly to Virginia and the Carolinas, but by far the great majority landed first on the shores of the Delaware and took up their settlements on the frontiers of Pennsylvania and spread from there southward. This colony has been rightly called "the seed plot of frontier emigration," for beginning about 1732 a constant stream of emigrants, composed of Germans and Scotch-Irish folk, flowed to the south and southwest along the great valleys into the western portions of Maryland, Virginia and North Carolina. Eventually the Scotch-Irish penetrated even further into South Carolina and Georgia. This sturdy and God-fearing people formed the chief element in the population of the frontier counties from Pennsylvania to Georgia, overflowing into what later became Kentucky and Tennessee. It is estimated that the Scotch-Irish comprised about one sixth of the colonists at the Revolution. They and their descendants have played a very large part in the political and religious history of the country.

The British colonists were in general a substantial and highly moral folk, but it appears to be true that among the indentured servants there was a considerable number of transported criminals. Some political offenders were sent to America, chiefly Scotch prisoners of war. A few hundred captured at the battles of Dunbar and Worcester in 1650 and 1651 were sent to New England. Again, following the suppression of the uprisings in Scotland in 1678 and 1716 and after the battle of Culloden in 1746 companies of Scotch prisoners were sent respectively to Virginia, Maryland and South Carolina. But recent investigation seems to indicate that by far the larger number of convicts sent to America were not political offenders. Some criminals were sent to the colonies in the earlier period, but the practice became more common after the English statute of 1670 and especially after the act of 1718, by both of which transportation to America was permitted in place of capital punishment for certain crimes. The records of Old Bailey alone indicate that between 1717 and 1775 not less than 10,000 were transported. Doubtless in many of these cases there were mitigating circumstances. Proof exists that all the middle and southern colonies served to some extent as penal settlements, but the most of the prisoners appear to have been shipped to Virginia and Maryland. Stith in his 'History of Virginia,' published in 1747, wrote "Virginia has come to be reputed another Siberia, or a hell upon earth." Scharf estimates the number of banished criminals in Maryland at 20,000, one-half entering after 1750. But the servant class was not recruited chiefly from the criminals. The majority of them were honest immigrants, who redeemed their passage to America by being bound out as indentured servants. This class was very considerable in both the southern and middle colonies. They were more numerous and important than slaves in the South during the seventeenth century, and formed a very considerable and important factor in the economic life of the middle colonies in the following century. Pennsylvania had an especially large number, mostly Germans and Irish. In addition to the whites, representing almost all the various branches of the Teutonic and Celtic races, there was another large foreign element imported into the colonies, namely the African negroes, who were held as slaves. Although first introduced into Virginia as early as 1619, they were not numerous during the first half of the century. In the last half, however, they rapidly increased in Virginia and Maryland, so that by the opening of the new century they probably equaled the number of indentured servants in these colonies, and the African slave trade became an important branch of foreign commerce. The growing demand for slave labor on the plantations in all the southern colonies led to a great increase in their number. Bancroft places the total slave population of the English colonies as 59,000 in 1714, 78,000 in 1727, 310,000 in 1760 and about 500,000 in 1775, or approximately one fifth of the total population. Fully four fifths of these were in the colonies south of Pennsylvania and comprised about one third of the inhabitants of that section. Here was a racial element destined in time to affect materially the development of the life and thought not only of the South, but also the political and social history of the whole country.

The steady growth of the colonies during the 18th century is indicated by the following figures. According to the report compiled by the Lords of Trade in 1721 the population had increased to a half a million. Dexter, a very careful investigator, estimates that by 1743 it had reached 1,000,000, by 1767, 2,000,000, and was about 2,500,000 at the opening of the Revolutionary War. His figures are in substantial agreement with those of Bancroft. It is probable that about one third of the population in 1775 were immigrants. The stream of immigra-

tion was interrupted by the war, but began again after the return of peace. There is, however, almost no data and even estimates appear to be lacking for the period of the Confederation. It has been estimated that the number of immigrants to the United States in the decade following the first census of 1790 was about 5,000 per annum. This may serve as a rough basis for calculating the number for the preceding decade, although it is hardly probable that it was as large during the unsettled years of the "Critical Period." See also POPULATION.

Bibliography.— Dexter, 'Estimates of Population in the American Colonies' (1887); Wright and Hunt, 'The History and Growth of the United States Census' (1900); Bancroft, 'History of the United States,' IV. 127–129 (1852); Lodge, 'Short History of the English Colonies in America'; Hanna, 'The Scotch-Irish in America' (1902); MacLean, 'The Scotch Highlanders in America' (1900); Kuhns, 'The German and Swiss Settlements of Colonial Pennsylvania' (1901); Baird, 'Huguenot Emigration'; Butler, 'British Convicts Shipped to American Colonies'; Dubois, 'Suppression of the African Slave Trade to America.'

HERMAN V. AMES,
Professor of History, University of Pennsylvania.

9. United States — Finances of (1775–1789). The fiscal systems of the several American colonies were of a simple character; expenditures were small and taxes were correspondingly light. Some of the local governments levied excise duties upon articles of luxury; nearly all placed tariff duties upon imports or exports; and the property tax was generally imposed. Illustrations of tariffs are found in tonnage duties, export duties on tobacco, import duties on slaves, and in a few colonies in more extensive tariff schedules on a considerable number of articles of merchandise. Public credit was almost unknown; there were no banks in the modern sense, and consequently no influential agencies for making loans. When emergencies arose, necessitating extraordinary expenditures, the colonies generally resorted to emissions of bills of credit, or promissory treasury notes. In some instances these issues were so large that the notes depreciated in value, resulting in partial repudiation. When hostilities actually broke out in 1775, the Continental Congress found itself without resources and without power to collect revenue; funds, however, were needed at once, and there seemed to be no other recourse than to issue bills of credit. The agitation for separation from the mother country was in a large measure inspired by the suspicion that England intended to impose a system of taxation without the consent of local bodies; and this suspicion of external taxation extended even to the collection of revenue by the colonies in common. Each commonwealth wished to maintain its revenue powers without abatement even if the object was the good of the whole. Between June 1775 and November 1779 there were 40 emissions of notes with a total issue of $241,000,000. In addition the States put out $209,000,000. These issues rested upon the faith of Congress which repeatedly called upon the several States to provide means for redemption, but these pledges were not made good. The notes consequently depreciated in value, until in 1780 Congress recognized that its efforts were in vain, and made provision for the acceptance of paper in place of silver at the rate of 40 to 1. Depreciation continued until the notes were regarded as worthless. The funding act of 1790 provided for the retirement of notes, still in circulation, at a rate of 100 to 1; at this date it was estimated that about $78,000,000 was still outstanding. (See MONEY, PAPER.)

Congress also sought fiscal aid by making requisitions on the different States, by borrowing both at home and abroad, and by attempts to secure national taxation. Requisitions were made both in specie and in specific supplies; the yield of the former was less than $6,000,000, and the demand for specific supplies in the form of corn, beef, hay, etc., proved not only wasteful but ineffective. In order to borrow money, loan offices were established in the several States, at which indented certificates were sold, bearing interest varying from 4 to 6 per cent. In all $63,000,000 was thus borrowed having a specie value of $7,600,000, according to the scale of depreciation adopted by Congress in 1780. After 1782 Congress was unable to pay the interest and therefore issued to the holders of certificates indents which became current in the payment of State taxes and were receivable by Congress in the payment of requisitions made upon the States. Foreign loans, 1777–83, were obtained as follows: France $6,352,000, Spain $174,000, Holland $1,304,000. Small loans were obtained in France as early as 1777 and these proved of great service in the purchase of military supplies and in the payment of the interest of the domestic loans. Beginning with 1782 bankers' loans were placed in Holland, and fortunately these were continued after peace was restored until the new government was established in 1789. During the years 1784–9, the Dutch loans amounted to $2,296,000. The efforts to secure a national tax were unsuccessful. The Articles of Confederation which went into effect in 1781, practically granted no financial power to the new government. It was provided that all expenses for the common defense or general welfare should be deferred out of a common treasury supplied by the several States in proportion to the value of land and improvements; and the taxes were to be levied under the direction of the State authorities. In 1781 Congress recommended a duty of 5 per cent on imports, but unanimous consent could not be obtained from the States; in 1783 a more elaborate tariff was proposed, but again the approval of the States could not be secured.

The administrative management of the finances by the Continental Congress well illustrates the jealous attitude of a democracy desirous of maintaining its liberties and fearing all forms of centralized authority. At first there were two treasurers, then a committee of thirteen congressional delegates, followed by a treasury board which handled all public moneys. Finally in 1781 the fiscal machinery was concentrated, and Robert Morris was chosen superintendent of finance. By the use of his personal credit in borrowing funds, he introduced new vigor into the government, but his efforts to create a national system of revenue were fruitless. Through his advice the Bank of North America was established and during the years 1782–3 this proved of aid in making temporary loans to the government.

In 1784 the indebtedness of the national government, apart from the outstanding bills of credit, was $39,000,000, bearing an annual interest charge of $1,875,000. This burden together with the ordinary expenses of government proved too much, and the national treasury rapidly drifted toward complete bankruptcy. In 1787 a national convention was held to frame a constitution which should endow the government with larger financial powers. The new Constitution gave to Congress the power to lay and collect taxes, and denied to the States the right to lay duties on imports or exports except what might be absolutely necessary for executing its inspection laws. This gave to the government the power it had so sadly needed, and proved to be a firm support when the new government went into operation in 1789. See FINANCE; UNITED STATES — FINANCES OF THE (1789–1816).

DAVIS RICH DEWEY,
Massachusetts Institute of Technology.

10. United States — The Federal Convention of 1787. Early in the War of the Revolution the several colonies represented in that revolutionary body, the Continental Congress, recognized that some form of a regularly ordained central government was desirable. It was 17 November 1777, however, before that body could agree upon the draft of a constitution, the Articles of Confederation, and the delay in ratification by the legislatures of the States prevented the new government being established until 1 March 1781. Even before the Articles were drafted the national enthusiasm of the years 1775–6 had cooled, most of the States had meanwhile drawn up their constitutions, and having had the selection of governmental powers there was little left to confer upon the general government, as they held tenaciously to all the powers they had appropriated. The States also became jealous of Congress and of each other. "There was an excess of State pride and a sad lack of national feeling." The change in the spirit of the people was voiced by Rutledge who declared he was "resolved to vest the Congress with no more power than was absolutely necessary," and this accounts in large part for the weak and defective character of the Articles as a plan of government. An additional reason for the weakness of the Articles was that they were not based upon American experience, but were modeled after those European confederations with which Americans were most familiar, namely the Dutch and the Swiss. It is small wonder, then, that they were not adapted to meet the needs of this country. Even before they went into effect Washington had characterized them as "a shade without substance." The truth of this was soon rendered evident. The short history of the Confederacy is an inglorious one. This government had no self-sustaining capacity, as there was a total lack of coercive power to enforce obedience to its laws. Congress was wholly dependent upon the good will and co-operation of the State governments, as it acted upon them and not upon individuals. Hamilton recognized this as "The great and radical vice of the Confederation," and Randolph subsequently referred to it "as a government of supplication." As soon as the war was over, and the pressure of a common danger was removed, there was a tendency toward decentralization,— the general government being regarded as burdensome,— and the authority and character of Congress declined.

In practice the lack of power of Congress to lay taxes soon greatly embarrassed it. It depended wholly upon requisitions on the States for the means of paying the interest upon the debt, contracted to carry on the war of Independence, and to meet the current expenses of the government. These were largely neglected or refused. Even before the Articles had gone into effect this defect was anticipated, and as a step toward greater efficiency the Continental Congress recommended, on 8 Feb. 1781, an amendment to the State legislatures, authorizing the general government to lay a duty of five per cent *ad valorem* on imports to pay the foreign debt. All the States consented except Rhode Island. She considered it "the most precious jewel of her sovereignty that no State be called upon to open its purse, but by the authority of the State and by her own officers." Her refusal was sufficient to defeat the project, although Virginia soon afterward withdrew her consent.

In the fall of 1781 Congress made requisition for $8,000,000, but over a year later only $500,000 had been paid. Accordingly, that body again proposed another revenue amendment, 18 April 1783, this time seeking for a grant of power to lay moderate specific duties on certain enumerated articles and five per cent on all others for the period of 25 years. As a concession to the States the collection was to be made by officers appointed by them. This proposition met with even a less cordial response than the former one. As late as 1786 four States had failed to give their assent, finally all but that of New York's was secured, but Governor Clinton twice declined to act upon the request of Congress to summon the legislature of that State in special session to reconsider its action, and so defeated the amendment and rendered the financial situation critical, as the compliance with requisitions had grown even more lax. Between 1782 and 1786 Congress had called for $6,000,000, but it received only $1,000,000. Some, like Georgia, had paid nothing, nearly all were in arrears, while New Jersey expressly refused to pay its last quota as a protest against the illiberal policy of New York. The impotence of Congress could not be more clearly demonstrated. A committee of Congress in 1786 declared that any further dependence on requisitions would be "dishonorable to the understanding of those who entertain such confidence," and that "the crisis had arrived when the people of the United States must speedily decide whether they will support their rank as a nation by maintaining the public faith at home and abroad."

The failure of the Articles to confer upon Congress power over commerce, either foreign or domestic, proved almost equally disastrous. England refused to grant us commercial rights, realizing that Congress had nothing to give in return and was powerless to retaliate. Congress, therefore, proposed a third amendment on 30 April 1784, asking the States to grant to it for 15 years the power to prohibit the entrance into the ports of the country the vessels of foreign countries not having commercial treaties with the United States. This was especially aimed at Great Britain, and it was hoped that

it would be instrumental in securing favorable commercial concessions from her and other foreign nations, but more than two years later several of the States had failed to comply with the terms of the proposition. This attempt failing, each State was left to regulate trade in its own way, and the way of each differed from that of every other. Not only did it prove impossible to secure a uniform policy toward foreign nations, but they were soon engaged in what Washington termed "a war of imposts" with each other, as each State had a different set of tariff and tonnage laws, which engendered discord, rivalry, and retaliatory regulations. Madison thus describes the situation: "The States having ports for foreign commerce taxed and irritated the adjoining States trading through them." New Jersey, lying between New York and Philadelphia, was compared to a cask tapped at both ends, while North Carolina, situated between Virginia and South Carolina, was likened to a patient bleeding at both arms.

The financial and industrial condition of the States was also very bad. In 1786 the situation was one of general depression, bankruptcy was impending. Seven of the States had sought relief in large issues of paper money. In Western Massachusetts the debtor class rose in an outbreak, known as Shays' Rebellion (q.v.) in November of that year, and before it was suppressed had greatly alarmed the friends of law and order and those who respected the rights of property. This outbreak is chiefly important owing to its influence in creating a sentiment favorable to a stronger national government. All signs seemed to point to an early dissolution of the Union. "Our situation," wrote Madison, "is becoming every day more and more critical. No money comes into the federal treasury, no respect is paid to the federal authority, and people of reflection unanimously agree that the existing confederacy is tottering to its foundation."

The Articles of Confederation provided for but one way of amendment, but the requirement of securing the unanimous consent of all the States as well as of Congress, rendered the amending provision nugatory. Some other means had to be found to reach the people than that prescribed by the Articles, if reforms needed were to be secured, but any other method would be extra constitutional and perhaps revolutionary. Such a means, however, had been already suggested. Passing by the early proposal for a convention by Thomas Paine in 1775, by Alexander Hamilton in 1780, and by Pelatiah Webster in 1781, it is worthy of note that the legislature of New York in July 1782, under the influence of Hamilton, was led unanimously to recommend the calling of a convention to revise the Articles of Confederation. After the news of peace in April 1783, Congress took up this resolution only to defer action, but Washington, in June, addressed communications to Congress and to the governors of the States urging the convoking of "a constitutional convention" "to form a new Constitution that will give consistency, stability, and dignity to the Union." This encouraged Hamilton to present his resolutions to Congress, but without result. At the suggestion of Governor Bowdoin the legislature of Massachusetts, 1 July 1785, adopted resolutions also calling upon Congress to recommend a convention to revise the form and powers of the government. But the States' delegates in Congress disobeyed their instructions and failed to present the resolutions, justifying their action on the ground that "to seek reform through a convention is a violation of the rights of Congress and . . . must meet their disapprobation." From these failures it was clear that the plan of inducing Congress to initiate the calling of a convention was vain. Some more indirect way of reaching the people must be resorted to. Fortunately it was shortly found. Owing to the friction resulting from the conflicting commercial regulations the legislatures of Virginia and Maryland had appointed commissioners, who met in the spring of 1785 to prepare the terms of an agreement for the jurisdiction over the waters common to both States. The legislature of Maryland approved of their report but desired that Delaware and Pennsylvania be invited to join with them in a common system of commercial regulation. James Madison, a member of the Virginia legislature and an advocate of a stronger union, took advantage of this suggestion and was instrumental in securing the adoption by the Virginia legislature, 21 January 1786, of a resolution inviting all the States to send delegates to a convention to be held at Annapolis in September, to take into consideration the question of the commerce of the whole country. Only Virginia and the four middle States were present at Annapolis. Realizing that they were too few for important action, at the suggestion of Hamilton, the convention issued an invitation to the States to attend a new general convention to meet at Philadelphia on the second Monday of the following May, to consider the whole situation of the United States. Virginia at once elected delegates, and six other States did likewise, before Congress took action. Finally, on 21 Feb. 1787, that body was led to give its sanction, although avoiding all reference to the other call, it fixed upon the same time and place for a convention as already proposed, "for the sole and express purpose of revising the Articles of Confederation and reporting to Congress and the several State legislatures."

The convention was formally organized on 25 May 1787 with the election of Washington as President. For nearly four months it continued in session in Independence Hall, sitting with closed doors, as nothing but its completed work was given to the public. Not till 1819 was its journal published, and Madison's notes, the best report of the debates preserved, were not printed till over half a century after the convention adjourned. All of the States but Rhode Island were represented, although New Hampshire was not present until 23 July. Seventy-three delegates are known to have been appointed, but of these only 55 were in attendance. They comprised nearly all of the men of the greatest experience, authority, and ability in the country. All but 12 had served in Congress and knew at first hand of its impotence. Among the delegates — classed by the parties into which they were shortly grouped — may be mentioned as the leaders of the Nationalists, Madison, Hamilton, Wilson, Gouverneur Morris, Charles Pinckney, and King; as the champions of the confederation, Patterson, Lansing, Yates,

and Luther Martin, while chief among the advocates of compromise were Franklin, Sherman, Ellsworth, Dickinson, Gerry, and C. C. Pinckney. Many difficulties confronted the convention at the outset, owing to the conflicting instructions of the State legislatures and the divergent views of the members. They were at first divided into groups of the large and the small States, those who wished to draw up an entirely new scheme of government national in scope, and those who simply desired to amend the Articles. As the work of the convention progressed other combinations were effected, in which the North was arrayed against the South, or the commercial against the agricultural States. The task before the delegates was to harmonize all these conflicting ideas and interests so that they might be brought to substantial agreement upon a plan which was calculated to command the approval of the people and infuse new life into the Union.

On 29 May, as soon as the convention had been fairly opened, Edmund Randolph presented the Virginia plan, which was probably largely drawn by Madison. It proposed a fundamental change in the government from a confederation to a federal union of States. It made provision for three distinct departments of government, a national legislature, executive, and judiciary. The legislature was to consist of two branches, the first branch (representative) to be elected directly by the people of the respective States, the second (senate) by the first branch out of candidates nominated by the State legislatures. Representation in both branches was to be apportioned among the States according to the quotas of contribution or the free inhabitants. In addition to the powers under the confederacy, the Congress should legislate in all cases in which State legislation would interrupt the harmony of the United States, should have a negative on State laws contravening the articles of union or its laws and treaties, and might coerce a delinquent State. The executive should be chosen by Congress for a limited term, and with a part of the judiciary should form a council of revision with a limited veto on legislation. An independent national judiciary was provided for. The remaining resolution related to the admission of new States, the guaranteeing to each State a republican form of government, the requirement of an oath to support the national Constitution from State officers, provision for amendment and the ratification of the new Constitution by conventions of the people. This plan was nationalistic in its tendency, although favoring the large States. It became the basis of the Constitution. On the same day Charles Pinckney, of South Carolina, presented a plan of government. The so-called "Pinckney Plan" first published in 1819 in the 'Journal of Congress,' has long been known to be a document of little authority. Recently attempts have been made to reconstruct this plan, and within the last few months a contemporary manuscript has been found giving what is believed to be the chief provisions of this plan. This would seem to indicate that the plan Pinckney actually presented suggested a considerable number of provisions that were incorporated into the completed Constitution, and entitle him to greater credit than he hitherto has been accorded by scholars. It is impossible here to present the details of this draft, but suffice it to say that it was national in character, made provision for the three departments of government, namely, a bicameral legislature,— the senate and house by name,— a single executive with the title of President, and a federal judiciary, and suggested several additional features in regard to the powers of the executive and legislative departments.

The debates in the convention naturally fall into three periods. During the first period from 30 May to 19 June, the proceedings took place chiefly in the committee of the whole. The Virginia plan was under discussion for several days, when on 13 June this plan, somewhat amended, but practically intact, was reported favorably to the convention in 19 resolutions. The chief changes made provided that a national government ought to be established, that the term of members of the lower house should be three years and of the upper seven years, and for the executive one term of seven years, and dropped the clauses for the coercing a State and for the council of revision, leaving to the executive a limited veto. During this discussion the antagonism between the large and small States had become evident, as the provision for proportional representation in both houses had been retained. This would give to the large States of Virginia, Massachusetts and Pennsylvania nearly a majority in both branches of the legislature. North Carolina, South Carolina and Georgia also voted for this provision probably in anticipation of future growth. This called forth a plan from the small States, which was presented on 15 June, by William Patterson of New Jersey, and is generally known as the New Jersey plan. This proposed no change in the basis of the government, which was still to be a confederacy. The existing Congress was to be preserved, but a plural executive chosen by Congress and a judiciary appointed by the executive department with well defined jurisdiction, were provided for. Congress was to be given additional powers to enable it to levy customs duties and internal taxes, and to regulate commerce and for enforcing the payment of requisitions. The acts of Congress and treaties were to be "the supreme law of the respective States," and the executive was authorized to enforce obedience to the same. Once more the Convention went into the committee of the whole to consider these two plans. The issue of a national government or a confederation was clearly presented and on 19 June the committee reported back the Virginia plan. It may be of interest to note that on the day before this, Hamilton, expressing his objection to both plans, sketched the outline of a system which was the embodiment of his views. He advocated a stronger and more centralized government, in which the States would have been reduced almost to administrative divisions of the central government. The Assembly was to be chosen by the people for three years, the senators to be chosen for good behavior by electors, and should represent property. The executive to be chosen for good behavior by a more complicated electoral system. He was to be vested with an absolute negative on congressional legislation. The governors of the States were to be appointed by the central government and were to be given an absolute negative on State legislation. As one of the delegates remarked, "Hamilton was praised by many but supported by none."

During the second period of its deliberations, which extended from 19 June to 26 July, the convention was occupied in the discussion of the 19 resolutions agreed to in committee. It was in this period that the great contest between the large and small States, or better, between the national and confederate parties took place. The nature and character of the new organization was at stake, and was involved particularly in the determination of the question of representation. The large States insisted upon proportional representation in both houses of Congress, the small States refused to enter the Union on any such terms. On 2 July a proposition for equal representation in the Senate was lost. The excitement was intense, the convention seemed on the point of dissolving. Sherman declared, "We are now at a full stop. Nobody, I suppose, means that we shall break up, without doing something"; and he suggested a committee as "likely to hit on some expedient." The matter thereupon was referred to a committee of one from each State. They reported 5 July, favorably to equal representation in the Senate and proportional in the House, and as a concession to the large States that the House should originate money bills. To the resolution as reported there was subsequently added the proviso that in the apportionment of representatives and direct taxes "three fifths of all other persons" (slaves) should be counted, which was the rule fixed upon for the apportionment of quotas in the revenue amendment of 1783, and which had been agreed to by the legislatures of 11 States and already had been incorporated in the report of the committee of the whole of 13 June. This proviso should not, therefore, be considered as an essential part of this compromise. This report agreeing to equal representation in the Senate at first excited a storm of protest, but the entire resolution was finally adopted 16 July, by a vote of five States to four, one State being divided and three unrepresented. Thus this compromise, involving the structure of Congress and the organic nature of the government was determined by a vote of less than a majority of the States present and by the representatives of less than one third of the people of the States. The effect of this compromise was most marked. The small States now gave up their opposition to the reorganization of the government and joined heartily in the work of providing an efficient organization and adequate powers for the new government. The other important modifications of the plan made during this period were substituting for the phrase "National Government" the "Government of the United States," shortening the term of representatives to two years and of senators to six years, and providing that the latter should retire by thirds, omitting the provision for the negative on State laws and inserting "the supreme law" clause first suggested in the New Jersey plan. Some of these changes show a departure from nationalism in the direction of federalism, and indicate that the spirit of compromise was at work. On 24 July a "Committee of Detail" was appointed to prepare the draft of a Constitution conformable to the resolutions adopted by the convention. Two days later the 23 resolutions already agreed to, together with the Pinckney and New Jersey plans were referred to this committee. Then the convention adjourned until 6 August to await the committee's report. On that date they reported the draft of a Constitution in which the main features of the completed Constitution already appear.

We now approach the third period of the work of the convention, extending from 6 August to 17 September. During these six weeks the debate over the details of the draft progressed, and while great diversity of opinion was exhibited, it proceeded in the main without undue excitement, although the difference in the interests of the northern and southern States over commerce and slavery aroused for a time considerable excitement. Already during the preceding period it had become evident, as Madison records, "that the real difference of interest lay not between the large and small States, but between the northern and southern States. The institution of slavery and its consequences formed the line of discrimination." But these yielded, as in the case of so many other issues, to compromise. In regard to commerce it was agreed that Congress might regulate foreign and interstate trade but should not have power to lay any export tax. This was a compromise between the commercial States of the north and the agricultural States of the south. Again the northern States desired that Congress should have power to pass navigation acts, but the three extreme southern States objected, and refused at first to sanction the power except by a two thirds vote of Congress for fear that the slave trade might be interdicted. The situation became critical, and again a committee of one from each State was resorted to. On 24 August they reported a compromise which as amended provided that Congress should not prohibit the slave trade prior to 1808, but might impose a tax not to exceed ten dollars per head on such importations. This was carried by the votes of New England and those of the Carolinas and Georgia. By a similar combination of votes the clause requiring a two thirds vote to pass navigation acts was defeated. It is noteworthy that the Virginia delegates earnestly opposed this compromise. Subsequently the provision in regard to the rendition of fugitive slaves was agreed to. This probably formed a part of the above mentioned compromise. These compromises were severely condemned by later generations who forgot that slavery at that day hardly was regarded as a great moral issue. It is altogether probable, also, that these compromises generally have been over-emphasized and that others, perhaps of equal importance, have been overlooked. Certainly it is true, as has been well said, that "the Constitution is a series of compromises." No question gave the framers of the Constitution so much trouble as the choice of the executive. The convention vacillated between several plans and showed a strange fluctuation of sentiment. Several times it voted in favor of election by Congress; once it agreed to a choice by electors chosen by the State legislatures — a plan subsequently twice rejected. After repeated reconsideration the special committees in their report of 4 September, recommended the electoral system very nearly as it was finally adopted on 6 September. This was regarded as a compromise between the large and the small States, as by many it was expected that the ultimate election would usually devolve upon the House, voting by States. Thus it was said that the large

States would nominate while the small States would elect. Over the organization of the executive, also, there was great difference of opinion between those who desired a strong executive, vested in one man, and those who feared an approach to monarchy. These conflicting ideas were compromised by conferring upon the President great powers, but giving to the Senate or both branches of Congress certain checks and limitations upon the exercise of those powers.

It is impossible to enter further into the details of the convention. Suffice it to add that on 8 September, when the members approached substantial agreement on the chief provisions of the Constitution, a committee of five on "style and arrangement" was appointed. This committee made its report, largely drawn by Gouverneur Morris, on 12 September. It was arranged in seven articles with the various sections as in the present Constitution. Discussion upon this report continued until the 15th, when the Constitution as amended was agreed to. On Monday, 17 September the draft of the Constitution was signed by 39 of the delegates and the convention adjourned *sine die*. Three delegates present, Gerry, Mason and Randolph, refused to sign, owing to the strong national features of the document, and to the rejection of the proposal to hold a second convention to consider amendments that might be recommended by the State conventions. There is evidence that only four of the 13 delegates who had been in attendance, but were absent at the time of adjournment, were opposed to the Constitution; certainly the majority approved of it.

It has been truly said that "if Americans possess political genius to any degree, it is for adapting old institutions to new needs." The work of the framers of the Federal Constitution strikingly illustrates the force of this statement, and the institutional development of our fundamental law. The framers drew largely upon their experience both during the colonial times and under the State governments, and the chief features of the Constitution are but a selection and adaptation of the provisions of the contemporary State constitutions. The Constitution made provision for the establishment of a government which was neither wholly national nor wholly federal, but partaking of the features of both. It provided for a mixed system. As Madison remarked, "In some respects it is a government of a federal nature, in others, it is of a consolidated nature." Thus in the legislature, consisting of two bodies, the Senate is based upon the federal, the House upon the national principle. In the new organization of the government the legislative department was improved, the executive and judiciary were substantially created. All were modeled in large measure after the similar departments in the State governments. The powers of the general government were greatly increased, while those of the State governments were correspondingly decreased. Certain express limitations were laid upon the latter and certain other powers were denied both to the State and to the Federal governments. The convention by a tie vote refused to add a bill of rights, as the opinion prevailed that such a guarantee of individual rights was unnecessary as the Federal government was one of delegated powers only. By providing that the ratification of nine States should be sufficient to establish the new government the work of the convention was revolutionary.

In accordance with its resolves the Constitution was transmitted to Congress and after some attempts to amend, that body finally agreed unanimously 28 September, in accordance with the desire of the convention, to transmit the Constitution to the legislatures of the several States to be submitted to State conventions. At once there sprang up a great pamphlet and newspaper contest over the merits of the proposed frame of government. The most famous of these was a series of letters in advocacy of the Constitution written by Hamilton with the aid of Madison and Jay, subsequently collected under the title of 'The Federalist.' These exerted a profound influence throughout the country. 'The Letters of the Federal Farmer' by Richard Henry Lee, one of the foremost opponents of ratification, had the widest circulation and were the most effective of the pamphlets on the other side. The country was shortly divided into the Federalists and the Anti-Federalists. The former comprised chiefly the professional and commercial classes, who favored the new government because it would promote national credit and commercial intercourse. The Anti-Federalists were mainly the agricultural classes, who were the advocates of paper money, stay and tender laws and who opposed increased taxation. Geographically the strength of the Federalists was near the seacoast and in the few important valleys which were the highways of commerce inland, while that of the Anti-Federalists was in the interior and agricultural sections.

Hardly a provision of the Constitution escaped criticism, but the absence of a bill of rights was the most common and weighty objection raised. The fear that the strong general government provided for would encroach upon the sovereignty of the States and the liberty and rights of the individual was the chief obstacle to be overcome. The first State to ratify was Delaware (7 Dec. 1787), followed in the course of a month by Pennsylvania, New Jersey, Georgia and Connecticut. In three of the States the vote was unanimous, and in Pennsylvania, and Connecticut ratification was carried without difficulty, although in the former State there was a vigorous but small opposition. The first close struggle occurred in Massachusetts. The convention was very evenly divided and ratification was only secured (7 Feb. 1788) by a narrow margin, through the Federalists agreeing to the recommendation of a series of amendments. This plan was followed by all the subsequent conventions save Maryland, which ratified in April, to be followed by South Carolina in May. Eight States had now taken favorable action, but it seemed very doubtful if any one of the five remaining States could be brought to accept the Constitution unconditionally. The Virginia convention was the first of these to assemble, but the discussions were so prolonged that New Hampshire ratified before it, on 21 June, by a majority of 11, making the ninth State, and thus insuring the inauguration of the new system. Virginia followed on 25 June, by a majority of 10 votes in favor, out of 186, under the impression that it was the ninth State to take action.

The effect of these two ratifications upon the New York convention was fortunate. At first the opponents to unconditioned ratification had been in the majority. Finally a few of the opposition yielded sufficiently to permit of ratification by a majority of four, but this action was secured only by the Federalists consenting to a call for a second general constitutional convention to consider amendments. Happily this convention was never held. It has been impossible to refer to the important influence of certain men in the State conventions, but at least passing note should be made of the astuteness of the Federal leaders in the Massachusetts convention, of the heroic services of Hamilton and Madison, and the strenuous opposition of Patrick Henry and Lansing in their respective State conventions. Favorable action had finally been secured in the doubtful States, owing to the realization that the alternative of "the Constitution or disunion" was before them to choose from. John Quincy Adams truly said, "The Constitution was extorted by grinding necessity from a reluctant people." Of the two remaining States, the North Carolina convention on 2 August refused to ratify without a bill of rights and the Rhode Island legislature repeatedly refused to call a convention. Finally, after the new government had been inaugurated, and Congress, in response to the general demand for a bill of rights had submitted a series of amendments to the States, North Carolina ratified 21 Nov. 1789, but Rhode Island's adherence was not secured until 27 May 1790, by a majority of two votes, and only then as a result of threatened hostile commercial legislation by Congress. Thus the 13 original States were finally reunited under the new Constitution. For *Bibliography* see article UNITED STATES — PEOPLING OF THE. See CONGRESS, CONTINENTAL.

HERMAN V. AMES,
Prof. of History, University of Pennsylvania.

11. United States — Beginnings of Party Organization in the (and Growth of the Party System and Party Machinery). Political parties so-called have existed in the United States from the beginning of its independent national life. Even earlier, while the colonies owed allegiance to the governments of Europe, there were traces of political divisions and groupings among the colonists according to their inclinations to sympathize with one or another of the political groups contending for power in the old home, or according to their differing views upon colonial and local affairs. But party organization there was none until near the end of the 18th century. Federalists and Anti-Federalists were the parties of the great discussion upon the adoption of the Constitution, but they were unorganized groups of the leaders of opinion and their supporters, divided by their opposing views upon the sole question in debate. After that contest had been ended by the triumph of the Federalists the party names persisted for a time, and the divisions were upon questions of constitutional interpretation. No organs were developed for perpetuating these early parties or for enlarging their political functions. The beginnings of a form of organization which did permanently affect the development of the oldest of our true American parties appear during the first administration of Washington in the Democratic clubs that sprang up and spread rapidly through the country. These were in some cases organized in a manner remotely comparable to the organization of a modern party and did effective service in strengthening the group which supported the views of Jefferson. They were, however, discredited by the turn of events and their development was checked.

Party organization arose out of the search for methods of political action which would secure in a representative democracy the choice of men as servants of the people who would be truly acceptable to the people. To this end and in order that the electoral forces might not be scattered and lost, it was found necessary to make use of some form of nomination of candidates previous to an election. After the adoption of the Constitution the irregular and varying local methods previously in use (the secret caucus, the open public meeting, the local unorganized convention, assisted by systems of correspondence and consultation) were rapidly extended and made more effective, while more central agencies of nomination for State and national officials were developed. The difficulties and expense of travel led to the rise of the legislative caucus system for the nomination of State officers as early as the year 1790. The opposing parties were both represented in the State Assemblies by prominent members and it seemed but a natural expansion of their regular duties that they should choose suitable candidates for the State offices. Their recommendations were made known by proclamations signed by members of the caucus. Against constant and severe criticism the legislative caucus continued in most of the States to exercise the power which had almost by accident fallen into its hands down to the year 1824, and even later in a few States; then, under the pressure of popular demand, it gradually gave way to the growing convention system. In many instances during the period of its prevalence the legislative caucus of the States assumed the privilege of nominating presidential candidates.

The last years of the 18th century were marked by the rise of a distinct party organ for the nomination of national elective officers. This was the Congressional caucus which was of an origin similar to that of the legislative caucus of the States and grew out of the practice of the Federalist members of Congress of meeting, with more or less formality and official sanction, for the discussion of party policy. It was easy to carry over into the field of nomination the party power in their hands. Hamilton is credited with suggesting the first formal action of the Congressional caucus of the Federalists in favor of a candidate for the presidency in 1800, and so of originating the party organ. Evidences of such use of the Republican party caucus are to be found, however, in the history of the previous campaign. Both parties did so nominate candidates for the election of the year 1800. The efficiency, convenience and economy of the new agency, together with a natural human reluctance to surrender power once grasped, led to its continued use against constant and growing popular opposition. It was seen to have become fully established as a party organ when, in 1808, the Republican caucus was called by the Senator who had presided over that of 1804, "in pursuance of the powers vested

in him." By the Jeffersonian Republican party it was made so able and efficient a party engine as to render the acceptance of its decisions a practical test of party loyalty, not only in the official circle but throughout the rank and file of party membership in the country. Party discipline was firmly enforced and the Republican representatives in Congress saw that the behests of the caucus were respected in all the States. The nominating agencies in the States were manipulated in a manner to strengthen the national party organ, and the minority became almost helpless before it.

No method for choosing presidential electors was prescribed by the Constitution, that matter being left to each State to determine for itself. Three systems were employed in the early elections. In some of the States the legislatures chose the electors. In others candidates were nominated in large assemblies of prominent citizens, including members of the legislature, which foreshadowed the State conventions of later days. Names so chosen were placed upon the general ticket of the party. Other States elected the electors by congressional districts. The general ticket system gained ground over the others until by the year 1860 it was practically universal. The supremacy of the Congressional caucus, supplemented as it was by the power of the legislative caucus in the States, transferred the political authority of a free, democratic people to the hands of a few powerful leaders. The effects of the popular dissatisfaction with this form of party organization were apparent first in the yielding of the caucus in some of the States. The districts where the party was in a minority complained that they were unrepresented in the legislative caucus, and in concession to their demands a modified form of the caucus began to be used (first in Rhode Island) about 1807. This was known as the "mixed caucus," and was composed of the party members of the legislature together with delegates elected by the party in the districts in which the party sent no representatives to the legislature. Some 10 years later still further concession was made to public sentiment (first in Pennsylvania), by substituting a "mixed convention" for the mixed caucus. This also was made up of delegates popularly elected in the counties, along with members of the legislature, but the members of the legislature were permitted to sit in the convention only when they represented counties from which no special delegates had been chosen.

From 1817 to the final overthrow of the legislative caucus, which for nearly all of the States was completed in 1832, the mixed convention was preparing the way for the advent of a truly representative nominating machinery, the State convention. Pennsylvania was again the first State to take the advance step. In like manner the Congressional caucus gave way slowly before the popular distrust, but its ultimate destruction became certain when, in 1816, it manifested a determination to force upon the Republican party an unacceptable candidate for the Presidency. It was called again in 1820, but, in the face of the manifest temper of the people, decided to take no action. In 1824 it did once more and for the last time put forth candidates, but only a minority of the party members of Congress participated and it commanded no respect.

The Federalist party received a mortal blow in the election of 1800 and was slowly dying throughout the period of the dominance of the caucus. It held no more national caucuses, but in a variety of ways announced its candidates. In 1812 the Federalists held what has been called, though improperly, the first national convention. It was composed of delegates from 11 States, who met as a peace party to oppose the war with England. They adopted the candidates already nominated by the Peace Republicans, who had "bolted" the regular party ticket. During the unsettled period between the Congressional caucus and the national convention, State and local party agencies of diverse forms acted as nominating bodies. The legislative caucus was still active in some States; the assemblies themselves, as such, sometimes chose candidates; mass conventions, county conventions, district conventions, and popular mass meetings, all nominated presidential candidates, and some of those gatherings took pains to declare that they would not be bound by the proceedings of any congressional caucus. All available means were made use of to render clear the final condemnation by the people of the objectionable party organ. Having been tried and found wanting, it was swept aside, to give place to an agency more in consonance with the national spirit. Though a congressional party caucus is at the present day an acceptable part of the national party organization, it does not exercise the nominating function.

Nomination by conference or by preliminary meetings of party supporters, which might be called conventions, had always been practised in the States and local areas, and the use of a convention for nominating the chief executive officers of the nation was the application of a principle already familiar to the people. The first of the long series of modern national nominating conventions was that of the ephemeral Anti-Masonic party, which met in Baltimore, 8 Sept. 1831, having representatives from 13 States. A long "Address to the People of the United States" set forth the principles of the party somewhat after the manner of the platforms of later years, and presidential candidates were nominated. The political importance of this convention is not great, and it is significant only as standing first on the list. The two leading parties quickly adopted the convention method in national politics. In December 1831 the National Republicans — successors to the Federalists and predecessors of the Whigs — met in pursuance of a call by a legislative caucus in Maryland. All opposed to the existing administration to Andrew Jackson were invited to send delegates. Eighteen States and the District of Columbia responded, and the convention laid plans for rendering the new organ a permanent part of party machinery. The first Democratic national convention, which met in May 1832, was called by New Hampshire politicians and was composed of delegates from all the States except Missouri. The National Republicans were now giving place to the Whigs, and in the unsettled state of political affairs that party held no national convention in 1836, but legislatures and legislative caucuses put forth candidates. A Democratic convention was held, and that party has thenceforth convened with uninterrupted irregularity in national convention to

nominate party candidates for Federal elective office. By the year 1840 the Whigs also were equipped with adequate machinery, and held their nominating conventions with regularity thereafter.

The national convention cannot be said to have become a permanent part of the party organization until it had provided for its own perpetuation. This was accomplished first by the Democrats when, in 1848, a national central committee, consisting of one member from each State, was appointed by the convention, one of its duties to be the calling of the next succeeding national convention. Similar action by the Whigs in 1852 completed the organization of that party. Previous to that year Whig conventions had been called by a Congressional caucus or by a legislative caucus of some one of the States. Tributary to the national convention, which is, in theory, the gathering up of the myriad expressions of political opinion throughout the whole country, is a long series of State conventions, district conventions, county conventions, city conventions, until the unit of party organization is reached in the ward or township primary, or caucus, made up of individual voters. All this complex machinery is kept in condition for effective action by means of committees appointed in the various election areas. Details of the system vary widely in the several States, but each State has its State central committee with a general supervision of the subordinate party agencies of the State. The national committee consists of one member from each State and Territory. It has general charge of the national interests of the party. Next in rank is the national congressional committee, first appointed in 1866 by a Republican congressional caucus. A few years later the congressional caucus of the Democratic party took similar action. The Republican congressional committee consists of one member of Congress from each State or Territory represented by a party member. In the Democratic congressional committee a State or Territory having no party member of Congress is represented by an outside member of the party. It is the duty of the congressional committee to supplement the action of the State and national committees and more especially to take charge of the elections of members of the lower House which occur midway between two presidential elections. In this matter the committee co-operates with local committees in the congressional districts of the various States. The party committees hold a most important and responsible position in the organization. They are the permanent party officials who formulate the party rules, administer the enormous party funds, and have general control over party business.

Since about the year 1880 the convention system has undergone considerable modification in the direction of legislative control of nominations. Under the fully developed system direct nomination is confined to the local officers in precinct, ward or township where the primaries are held. Here the individual members of the party by their direct votes nominate the party candidates for local office. Candidates for the larger areas of city, county, judicial district, congressional district and State are nominated indirectly by delegates chosen at the primaries. Two methods of procedure are in use at the primaries. The older is that of the mass meeting of party voters, most commonly called the caucus. It is organized by electing a chairman and a secretary, and the voting for local candidates or for delegates may be by ballot, or by any method prescribed by party rules, or by vote of the members present. The newer method is that of the primary election, which substitutes for the mass meeting a regular election held under the control of party or State officers, where qualified members of the party cast their votes one by one, for candidates for office or for delegates to nominating conventions.

The adoption of the primary election system does not necessarily do away with the nominating convention. Direct nomination may still be limited to local officials; but the primary election method admits of being indefinitely expanded, as the mass convention or caucus system does not. It may be so extended as to perform all the functions of the various conventions within the State, and this it is which makes the introduction of direct election in the local areas of special significance. Instead of calling upon the primaries of a county to choose delegates to attend a county convention for the purpose of placing in nomination candidates for county offices, the county committee may notify the party electors to proceed, at a certain time and place, to vote directly for candidates of their own choice. In such a case the primary elections held in the several precincts of the county supplant the county convention and exercise its functions. In like manner a congressional district composed of several counties may provide for choosing the party candidates for the House of Representatives by direct vote at the local primaries of the district, thus doing away with the need of a congressional nominating convention. In the same direct way candidates for judicial and State offices may be nominated, and the convention within the State be wholly displaced.

The discontinuance of the convention involves radical changes in party organization. The permanent committees, the platforms, the rules for the control of party conduct, have all been the product of party conventions. When the convention disappears all party functions devolve upon the primaries and the officers chosen by them.

It has not been seriously proposed to abolish the national nominating convention and transfer to the primaries the additional duties of nominating candidates for the presidency by direct vote, formulating quadrennially the national party platform and choosing the national committee. But there is a natural distinction between national and State politics. Issues arise within the States which have no direct relation to national affairs, and which furnish a natural line of cleavage for the parties. For the formulation of party issues and the development of party policies the convention is found to be a more convenient agent than the primary. Some of the States in which direct nomination is extensively practiced still retain the State convention for nominating State officers and promulgating the State party platform. Where the State convention has yielded to the movement for direct nomination, party issues are formulated by party officeholders, by party candidates and party com-

mittees, or by direct vote at the primary election.

The primary election system has been most widely introduced in those southern States in which one political party has control and a nomination is equivalent to an election. Here the real contest is within the ranks of the dominant party at the primary. The party members there vote directly for the various candidates, the votes are canvassed, and it is made a point of honor to abide by the decision so rendered. So important is the primary election that more votes are cast at it than at the legal election which follows. Some of the States — Mississippi, for example — have passed laws for the regulation and control of the primary election. In other States, as Georgia, the dominant party holds a similar election under rules formulated by the party organization.

But the development of the primary election system is by no means confined to the South; it extends to all sections of the country. Its object is to give to the unofficial members of the party greater power of control. The development of the system has coincided with the introduction of the Australian ballot legislation. These new laws require the State to print and distribute the ballots. This had formerly been an important party duty. Before the State officer can print the ballots he must have official information as to the names of candidates; the laws therefore prescribe a formal process of nomination by petition; but the real nominations are made by the political parties, and since the laws require some sort of official recognition of the nominating process, the State legislatures have been the more ready to yield to the already existing demand for legislation on the subject of primary elections. The result is that in many States the ordinary party machinery is becoming subject to State regulation and control. In 1901 the State of Minnesota passed a law providing for the holding of a primary election for the nomination of candidates to be voted for at the general election. The Minnesota primary election under State supervision is for all parties, who must all vote at the same place and on the same day. This provision makes it easier to confine the vote of each party to its own members. Under this law the candidates for State offices are not subject to nomination at the primary. The object of this exception was to preserve the State convention and render it convenient for party leaders to meet in conference and make declarations of party principles. A bill introduced a year later in the legislature of Wisconsin requires all important nominations of all parties to be made at the one primary election legally provided for. If such a bill should become law the State nominating convention would be displaced.

State control of party nomination leads to legal definition of party membership. Only members of the party have a right to vote at the primary. In Massachusetts, participation in a primary election of a given party disqualifies a man for voting at the primary of any other party for the ensuing 12 months without a formal legal notice of a change of party choice. Direct nomination at a primary election creates a demand for preliminary nomination of candidates, more or less formal, within the party itself. Party caucuses and conferences are utilized for this purpose. See DEMOCRATIC PARTY; REPUBLICAN PARTY; WHIGS.

JESSE MACY,
Professor of Political Science, Iowa College.

12. United States — The Colonial and Territorial Systems of the. Under the generally well-known name of "territorial government," the United States has developed one of the best systems of colonial government that has ever existed. When, acting under the suggestions of Maryland, several of the colonies between 1780 and 1784 surrendered to the federal authority their claims to lands west of the Alleghanies, some provision had to be made for the government of them. This was done by the Ordinance of 1784, which provided for (1) the division into States; (2) the establishment of temporary governments; (3) the establishment of permanent governments and the admission of the prospective States into the Union as full States when a certain number of population had been reached; (4) the maintenance of a republican form of government in the States; (5) and the subjection of each new State to the Articles of Confederation. Grayson's Land Ordinance of 1785 made provision for (1) the survey of the lands; (2) its division by north and south, and east and west lines into townships six miles square; (3) and finally its sale in lots to purchasers. By 1787 all of the land north of the Ohio River, known as the Northwest Territory (q.v.), had come under the jurisdiction of Congress. Meantime an emigration company, called the Ohio Company (q.v.) had been formed in Massachusetts for the purpose of exploiting and settling these western lands. It had failed of success partly because settlers were unwilling to go to a land where so little guarantee was made for personal rights as in the Ordinance of 1784. The head men of the company therefore petitioned Congress for legislation which would give the guarantees desired. The result of this petition was the passage of the Ordinance of 1787. This contained the personal rights asked for, such as trial by jury, habeas corpus, etc., made arrangements for the treatment of the territory as one, or later as two, districts, and made provisions for two successive forms of territorial government. At first a governor and three judges appointed by Congress were to act as a legislature, as well as fulfil their own special functions as executive and judiciary. When there were 5,000 free male inhabitants of full age in the district, they were to receive authority to elect a general assembly or lower house of a legislature, but the upper house or legislative council of five members was to be appointed by Congress from a list of 10 names submitted by the lower house. The two houses meeting jointly were to choose a delegate to Congress who was to have a seat and the right of debating but not of voting. The governor, judges, and administrative officers were still appointed by Congress. The keystone of this ordinance, and that which placed the American colonial system above all other systems, was the provision which allowed the division of the territory into three to five parts, and when any one had 60,000 inhabitants it was to be admitted to the Union on an equality with the other States.

The Northwest Ordinance has formed the basis for all later territorial governments in

the United States. As strong doubt was expressed as to the right of Congress of the Confederation to pass such a law, the first Congress under the Constitution confirmed the ordinance by the Confirmatory Act of 1789, and gave to the new President all the powers therein exercised by the old Congress. This it was enabled to do under the clause of the Constitution which reads that Congress shall have power "to dispose of and make all needful rules and regulations respecting the territory or other property belonging to the United States." In 1796 Congress passed, for the territory south of the Ohio River, an ordinance which was almost the same as the Northwest Ordinance.

With the great additions of territory (see TERRITORIAL EXPANSION) to the United States by the Louisiana and Florida purchases and subsequent wars and treaties came the necessity of providing territorial governments. All of these were very similar to that outlined in the Ordinance of 1787. As all of the land now comprised within the United States, with the exception of the original 13 States, Vermont, Kentucky, West Virginia, Texas, and California was at one time or another under territorial government, it is easily realized how important a good colonial or territorial system of government has been to the United States. In all its vast area there are at present only three territories left: Oklahoma, New Mexico, and Arizona. The territorial governments, on account of their common basis, have been very similar, even though entirely dependent on the will of Congress. At the head of each territorial government stands the governor. He, with any administrative officers he may need, is appointed by the President for a term of four years, and is removable by him with the consent of the Senate. In earlier times the governor was usually sent out from the East, but recently some man prominent within the territory has been chosen. The President also appoints judges for the territories for terms of four years. The male inhabitants of the territory, of full age, are allowed to elect a legislature of two houses, a council and a house of representatives. The legislature may pass laws on a large variety of subjects and arrange for local and municipal governments. The governor, however, has a veto on any laws, but they may be passed over his veto. Congress may at any time override statutes passed by a territorial legislature. This, however, is not often done. The territory has the privilege of sending a delegate to Washington, to sit in the House of Representatives. He has the salary and all the rights and privileges of a regular member of that house, except the right to vote. Congress may, of course, withdraw a territorial government at any time, but this has seldom been done. When the territory has reached a certain population (the number has varied much), Congress may admit it as a State by ratifying and accepting a constitution already drawn up by the people, or it may pass an Enabling Act. Under this the voters elect a convention to draft a constitution. If this is accepted the territory forthwith becomes a State on an equality with other States of the Union. Congress has at times imposed certain conditions in the Enabling Act. Whether these conditions are binding on the State if it afterward disregards them is a mooted point.

Besides the territories organized as above, among which the Hawaiian Islands, acquired in 1898, may be included, there are certain lands under the jurisdiction of the United States, which may be called unorganized territories. These are Indian Territory and Alaska. In both of these the population is largely Indian, and that accounts for their different treatment. Indian Territory has a government with a legislature, but it sends no delegate to Congress like the other territories, has no organized government like theirs, and in reality is only a form of local government which Congress permits to exist for the time being and which it may abolish at pleasure without feeling that it is violating any of the rights or privileges which in the organized territories are looked upon by the inhabitants as guaranteed to them by a compact with Congress. Alaska has not even as complete a government as Indian Territory. By an act of 1884 Congress provided for a governor and a district court. Owing to the influx of white people at the time of the discovery of gold in the Klondike, Congress had to pass acts in 1899 and 1900 making more careful regulations for the government.

The United States had to confront new problems in the government of colonies or territories when Porto Rico and the Philippines were acquired in 1898. These islands could not be treated like the older territories of the United States. There were those, however, who held that they were the same and that all laws passed for the United States were applicable to these outlying domains in the same way as they were to New Mexico or Arizona. Still others maintained that such was not the case and that laws passed for the United States did not apply to Porto Rico and the Philippines. The latter view was upheld by the Supreme Court in the Insular Cases decision in 1901. This made possible a new colonial system of government for the United States and brought about the abandonment of the principles of the Ordinance of 1787, so far as these island possessions were concerned. A special kind of government has accordingly been worked out for Porto Rico and another one for the Philippines. Porto Rico has a governor and other administrative officials appointed by the President, a legislature of two houses, the upper one largely appointive, and the lower one elective. The old courts of the Spanish regime, including the municipal courts, are retained, but the island is now organized as a new judicial district of the United States. The district judge, district attorney and marshal are appointed by the President. The qualified voters of the island every two years choose a resident commissioner to the United States who is recognized as such by the departments at Washington and receives a salary of $5,000. For the Philippines a still more exceptional form of colonial government has been established. The inhabitants are allowed to participate in the municipal government, but are not allowed to have a representative legislature. The executive power is in the hands of a commission of five members appointed by the President. No provision has been made for the eventual admission of either Porto Rico or the Philippines to statehood.

With the addition of these outlying dependencies to the jurisdiction of the United States the

high ideal of colonial and territorial government set by the Ordinance of 1787 has not been followed. The United States has found that it has to handle these outlying domains in much the same way as England, France and Germany handle their colonies, and with little regard to those principles which were so vigorously upheld in the Declaration of Independence. In addition to the territories, organized and unorganized, and to the dependencies, the United States now provides for the government of the District of Columbia, national forts and sites, and Indian reservations. The regulations for these, however, scarcely form a part of the colonial or territorial system of government. The same is true of the virtual protectorates which the United States exercises over Cuba and Panama.

Bibliography.— Channing and Hart, 'Guide to the Study of American History'; Griffin, 'List of Books on Colonization'; Bryce, 'American Commonwealth'; Hart, 'Actual Government'; Reinsch, 'Colonial Government.'

JAMES SULLIVAN, PH.D.,
Professor of History, High School of Commerce, New York.

13. United States — Beginnings of Executive Departments of the. Prior to 1789 there was no independent executive, the departments of Foreign Affairs, War, and Finance being but the agents of the old Congress, and providing governmental machinery both feeble and inefficient. The new Congress met in 1789, established three departments, State, War, and Treasury, continued the General Post-office and created the office of Attorney-General. Here was the beginning of the executive machinery; its development into the enormous civil establishment of to-day has been irregular; new functions have been assumed by the government; the scope of old ones has been enlarged and constantly the work to be performed has increased in bulk.

The Department of State.— An act of July 1789 established a Department of Foreign Affairs, the sole duty of which was to conduct our relations with foreign countries. There were other duties, however, which it was thought that this department could perform advantageously, such as issuing commissions to presidential appointees, preserving and promulgating acts of Congress and executive orders and proclamations, and being custodian of the Great Seal, so in September the designation of the department was changed to Department of State, and it was entrusted with the performance of the duties just enumerated. From time to time other duties were added to it, such as issuing and recording patents, the supervision of the census, issuing warrants for pardons, corresponding with territorial officers, etc.; but these duties were performed by it only for a time, and have one by one been transferred to other departments, until at present the State Department retains only its original functions. The clerical force of this department has always been much smaller, and its organization much simpler, than those of the other departments; but as the relations of the United States with other countries have been extended, the force employed in the offices of the department has slowly increased. In 1792, an old civil list, or 'Blue Book,' shows that this government had six representatives abroad and that the secretary of state employed eight persons in his office; in 1821 there were 10 diplomatic agents and 83 consular officers, while the office force, exclusive of the three persons employed in issuing patents, had increased to 12. In another decade it had increased to 16, while there were nine more in the diplomatic service and 51 more in the consular service. At present there are 109 chiefs of divisions, clerks, and other employees in the State Department, and over 1,200 persons in the diplomatic and consular services. The organization of the department has developed slowly; at first certain clerks would be given certain kinds of work to do, probably because of a special aptness displayed; by 1833 we find a Diplomatic Bureau with three clerks, a Consular Bureau with two, a Home Bureau, and a Bureau of Archives, Laws, and Commissions of two each, while one clerk took care of the library and performed the clerical work connected with issuing pardons and copyrights, another had charge of disbursements, while a third, in addition to translating, performed such odd jobs as fell to none of the others. The organization of the department has continued, with some changes, along the line thus indicated; the bureaus which at first were organized by the secretary having since been established by Congress and chiefs provided for them. In 1853 an assistant secretary was appointed; and since that date the offices of second and third assistant secretaries have been established.

Department of the Treasury.— The act of 1789, establishing a treasury department, provided for a secretary, an assistant secretary, a comptroller, an auditor, a register, and a treasurer. In 1792 those offices employed 100 persons; in 1903 the 18 main offices, with their 65 subdivisions, into which the department is organized, employed over 3,000 persons. In 1792 about 500 officers collected the customs revenue, which in that year amounted to $3,400,000, while in 1902 nearly 7,000 officers and other employees were engaged in collecting the $254,400,000 accruing from the customs tariff. In 1802, 400 officers collected $621,800 as internal revenue, while a century later 4,000 persons collected an internal revenue amounting to $271,800,000. The gross receipts of the government in 1791 amounted to $4,770,000, while the expenditures were $3,790,000; in 1902 the former were $651,730,000, and the latter $559,240,000. The above statements serve to illustrate the growth of the fiscal operations of the government and the corresponding enlargement of the machinery for administering them. The Treasury Department has been the department to which offices for the performance of new governmental functions, when they did not clearly belong in one of the other departments, have been attached. Thus the General Land Office, the Bureau of Navigation, the Coast and Geodetic Survey, the Light-house Establishment, the Bureau of Immigration, and other offices, have been at one time or another a part of this department. The organization of the department has undergone many changes; the present accounting system, for example, is much modified from its original form. The comptroller and auditor as at first established were soon found unable to audit all the accounts of disbursing and receiving officers; in 1817 four more auditors were appointed as well as a sec-

ond comptroller, and in 1836 a sixth auditor was added. At this time a double audit of all accounts was performed, the comptroller revising the work of the auditors, but in 1894 a system of single auditing was introduced; the office of second comptroller was abolished and the comptroller became an officer of appeals from the decisions of the auditors. The duties of these latter were redistributed so that the accounts of any one department would go to the office of but one auditor. The seven offices engaged in auditing and accounting employ at present about 1,300 persons, in place of the 35 employed in the two offices in 1792. But besides enlarging and modifying old offices, new ones have been established. At first the internal revenue that was laid appears to have been collected under the supervision of the officer in charge of the customs revenue system. In 1862 the office of commissioner of internal revenue was created and has been continued to the present time. In 1792 the office of director of the mint was established, but did not become a regular bureau of the Treasury Department until 1873. In 1798 an act was passed providing for the establishment of a fund for the relief of sick and disabled seamen and shortly thereafter marine hospitals were established; in 1870 the Marine Hospital Service was reorganized, with a supervising surgeon-general at its head, and became a regular establishment of the Treasury Department. In 1862 the government took over the work of printing its own notes and securities, and in 1874 the Bureau of Printing and Engraving was established. In 1878 the Life-Saving Service was definitely organized in the Treasury Department, although as early as 1874 it had had its beginnings under the Revenue Marine Service. Finally, with the development of a system of national banks, issuing notes secured by bond deposits, the office of comptroller of the currency was created in 1863. The other offices of the department, those of treasurer and register, have remained as they were established, except for the increase in their forces, and certain changes in their duties; the register's office having become merely the place where the machinery connected with the public debt is located; its other functions have for the most part been absorbed by the secretary's office.

Department of War.—The growth of the War Department from two offices employing 18 clerks to an establishment of 18 offices employing about 1,700 persons in Washington, and over 18,000 at large, is readily understood when the expansion of the army, particularly of the engineer department, is taken into consideration. This growth can best be considered under the following heads: (1) The command and discipline of the army. The adjutant-general's department in practically its present form was established in 1821, as was also that of the inspector-general. Prior to that time they were merged under an officer with the title adjutant and inspector-general. The inspector-general, however, appears to have had no office force at the department for some time, while that of the adjutant-general was a permanent bureau from 1821, being a continuation of the office under the adjutant and inspector-general. (2) The pay of the army. As early as 1792 there was a pay-office in the department, it being one of the two offices then in existence, but the pay department by that name was not established until 1816. (3) The supply of the army. The purchase of supplies for the army was first performed by the Treasury Department, the office of purveyor of public supplies having been established in that department in 1794. In 1812, however, the ordnance and quartermaster-general's departments were established by law, and in 1821 the office of commissary-general of subsistence was created, which, in 1835, became the subsistence department. The medical department, under a surgeon-general, was permanently established in 1818, but an act of 1813 had created the office of physician and surgeon-general, and in reality marked the beginning of the organized department. (4) The engineer department. As early as 1821 there was an office in the War Department under the chief of engineers, and this has continued to the present time. In 1818 a Topographical Bureau was established in the War Department, but in 1863 it was merged in the chief engineer's office. The engineer department employs at present over 10,000 persons in its work on rivers and harbors, boundaries, fortifications, etc. (5) Military justice. The office of judge-advocate of the army was permanently established in 1849; in 1862 its title was changed to that of judge-advocate-general; in 1864 the Bureau of Military Justice was created in the War Department and the judge-advocate-general placed at its head, but in 1884 the title was changed to Judge-Advocate-General's Department. Other bureaus have been temporarily established; thus the Bureau of Refugees, Freedmen, and Abandoned Lands carried on the work of military reconstruction in the South between 1865 and 1873; the Provost Marshal General's Bureau existed from 1863 to 1866, and in 1898, when it devolved upon the War Department to establish civil government in the new island possessions, the Bureau of Insular Affairs was created.

The Navy Department.—In 1789 there was no navy; to-day we have a naval establishment, including the Marine Corps, of 300 vessels of all kinds, 25 navy-yards and stations, 2,700 officers, 35,000 enlisted men, and 19,000 civilian employees; the task of administering the affairs of the organization that guarantees our position as a world power has grown from work so slight that it could be performed by the secretary of war in addition to his other duties, to proportions that demand the energies of a great department. We had no naval affairs until 1794, when the depredations of the Barbary powers caused Congress to authorize the building of six ships, an establishment which, as the attitude of France became a growing menace to our merchant marine, was so rapidly enlarged that in 1798 a separate Navy Department was created. The new department was small at first; in 1802 the secretary and four clerks managed its business, while an accountant's office employing 11 persons conducted its financial operations and audited its accounts; this latter office was, however, transferred to the Treasury Department in 1817. Our foreign relations continued such that the naval establishment was rapidly increased, and by 1815 the administrative work had become too great for the simple organization of the department, under which nearly every matter received the secretary's personal

attention. Accordingly in that year a board of three navy commissioners was created, for the supervision of the construction, repair, equipment, and supply of vessels, and the superintendence of navy-yards. The department now consisted of two offices: the secretary's and navy commissioners', each employing four clerks; while the establishment was composed of 118 vessels, 6 navy yards, and 1,000 officers, including midshipmen. This organization lasted until 1842, when the force of each office had increased to eight. In that year the board of commissioners was abolished, and five bureaus, each with a naval officer at its head, were created, while the clerical force of the department was increased from 16 to 30. It was about this time that the scientific work of the department, which has expanded into the Naval Observatory, Hydrographic Office, and Office of the Nautical Almanac, was definitely inaugurated. In 1859 the department force had increased to 56. In 1862 three more bureaus were added, one of them being that of steam engineering, thus marking the change in motive power; in 1865 a law officer, the judge-advocate-general, was appointed, and by 1867 the department force had increased to 100. With the creation of the new navy the increase has been more marked; there being now 240 civilian employees in the department proper, exclusive of the 150 in the scientific offices.

The Post-Office Department.— The extension of the postal service, both from point of business done and of increased usefulness, is one of the most striking phases of the development of governmental activity. In 1789 there was already a postal system, but only in a small way; there were 75 post-offices and about 2,000 miles of post-roads. The increase in number of offices was very rapid from the first; in 1800 there were 803; in 1850, 18,417; and in 1902, 75,924, while the post-roads have stretched to cover 509,540 miles. During the same period the gross revenue of the service has increased from $40,000 to $122,000,000, and the expenditures from $32,000 to $124,000,000. Meanwhile the service has been greatly extended; in 1825 the Dead Letter Office was established, and the first provisions made for foreign correspondence. In 1835 mails began to be carried on steam railroads and in 1862 the railway post-office was introduced. In 1855 the registration system was introduced; which cared for 600,000 pieces of mail the first year, and over 22,000,000 in 1902. In 1864 the money order system was put into operation, which transferred $1,360,000 during its first year; in 1867 international money orders were introduced, and in 1902 the total amount transferred by the system was over $336,000,000. Finally, in 1863, free delivery in cities was provided, and in 1897 was extended to the country. The 63 city offices, with their 685 carriers, have increased to 933 with 17,785 carriers, while the 44 rural routes established in 1897 had reached 11,199 in 1902. With this growth the department force has kept pace; in 1802 it consisted of a postmaster-general, an assistant postmaster-general, eight clerks, and one messenger; at present it is organized in over 20 divisions which employ more than 1,200 persons.

Department of the Interior.— The Department of the Interior was established in 1849, and to it were transferred the most important duties relating to home affairs. It is composed of a number of wholly unrelated offices, the most important of which are described separately below. (*a*) The General Land Office is the medium through which the public domain of the United States is administered, surveyed, and disposed of. In 1789 the public domain, composed of cessions by the various States, was 270,000 square miles in extent; with the accessions of Louisiana, the Floridas, California, New Mexico, and Alaska, this area has been enormously increased, and through the operations of the Land Office much of it has been disposed of. The business connected with the public lands was first transacted by the secretary of the treasury, who in 1800 established four land offices, each with a register and a receiver. In 1812 the General Land Office, with a commissioner at its head, was established in the Treasury Department. Four years after its establishment it employed 14 persons, while the local land offices employed 47. During the next 20 years with the westward movement the business of the office increased to a considerable extent, and the office was reorganized in 1836. The next year the office force numbered 92, the force in the field 171. In 1849 the General Land Office was transferred to the Interior Department; its present number of employees is nearly 1,800, of which 450 are in the office proper. (*b*) Office of Indian Affairs From 1789 to 1849 Indian affairs were administered by the War Department, and, during the first part of that period under the direct supervision of the secretary of war. The supply and trade of the Indians received most attention at first; by 1802 an Indian department had been organized in the War Department, consisting of 19 persons who performed the duties of agents, factors, and interpreters, and who lived among the Indians; by 1816 another office, that of superintendent of Indian trade, employing five clerks, was created, and for a time this office and the Indian department existed separately. In 1823, however, they had been united; a superintendent of Indian affairs lived at St. Louis, and 67 agents and interpreters constituted the field force. In 1832 the Office of Indian Affairs was established and a commissioner appointed as its head; with this reorganization the work of the office was enlarged; the office force numbered five at first, while 174 persons in the field performed the duties of agents, interpreters, clerks, smiths, millers, and farmers; in a few years teachers were added to the list. In this way the Indian service was extended from mere supervision of trade and supply, to the establishment of communities among the Indians, each with its medical, educational, and industrial corps. The service at present employs nearly 5,000 persons, of whom 140 are in the office in Washington. (*c*) The Patent Office. The history of the Patent Office records the change from an agricultural to a manufacturing basis in this country. The first patent law was passed in 1790 and provided for the granting of patents by a board composed of the secretaries of war and state and the attorney-general; in 1793 they were granted by the secretary of state alone. During these first years the chief clerk of the State Department performed, in addition to his regular duties, the work connected with issuing patents, of which, by 1793, there had been only 57. Before

long a patent office was established in the State Department; at first this employed a force of three persons, but in 1836 it was reorganized, a commissioner was appointed as its head and the force had increased to 25. In 1849 the office was transferred to the Interior Department; its present force numbers about 750. Meanwhile the business transacted has increased with great rapidity. To 1793 57 patents had been issued, to 1836, 9,957; the increase has been most marked since 1848; in that year 584 patents were issued; in 1849, 988; while in 1900 the number was 24,660, making a total for the first 110 years of the government of over 674,000. (*d*) The Pension Office. Before 1789 pensions were granted and paid by the respective States, but in that year the Federal government assumed the obligation. The Pension Office was established in the War Department in 1833, the work having been performed under the direct supervision of the secretary of war prior to that time. During the first year of its existence the office employed 22 clerks; in 1902 it employed 1,741 in Washington and 432 in the field. This growth has come about with the great expansion of the pension system; in 1792 there were 1,472 pensioners; in 1902 there were 999,446, and the amount paid was $137,504,267. (*e*) Other offices. The Geological Survey, established in 1879, was the outcome of surveys made under specific appropriations since 1834; while the Bureau of Education was created in 1867.

Other Departments and Offices.— The origin of the Department of Agriculture can be traced to 1839 when the commissioner of patents was directed to submit an annual report on agricultural progress. In 1862 a Department of Agriculture with a commissioner at its head was established, which, in 1889, was made an executive department. Among its bureaus should be mentioned the Weather Bureau, established in 1890, but originating in the office of the chief signal officer of the army in 1870. The Department of Justice was established in 1870 and grew out of the Attorney-General's Office. The latest executive department, that of Commerce and Labor, was established in 1903, taking over from other departments such offices as the Bureau of Statistics, which originated in the Treasury Department in 1820; the Light-House Board, created in the Treasury Department in 1852; the Coast and Geodetic Survey, which originated with the coast survey made under the treasury in 1807; the Bureau of Immigration, established in 1891, and others. The establishment of the Department of Labor (now in the Department of Commerce and Labor) in 1884, together with the creation of the Bureau of Corporations (also in that department) prompted by the growing agitation in regard to trusts, as well as the creation in 1887 of the independent Interstate Commerce Commission, all mark a tendency on the part of the government to inquire into and regulate conditions of labor and trade. Finally should be mentioned the Civil Service Commission, established in 1883, and necessitated by that growth of the governmental machinery which has been described above.

W. G. Leland,
Carnegie Institution, Washington.

14. United States — The Cabinet of the. The Cabinet, as the name is used in American affairs, is the President's council. It is composed of the heads of the nine great executive departments. Four of these are older than the government under the Constitution, for the Old Congress had found it necessary to establish a Department of Foreign Affairs, of the Treasury, and of War. The Postoffice Department was established by the Continental Congress before the Declaration of Independence. The framers of the Constitution assumed that such departments would continue to be necessary. They perceived also that the heads of these should be at the service of the chief executive. Hence the provision that he — "the President — may require the opinion in writing of the principal officer in each of the executive departments, upon any subject relating to the duties of their respective offices." The first Congress under the Constitution re-established the executive departments already existing. To the Foreign Office it added certain internal affairs, and changed the name to the Department of State. The office of Attorney General was also established in 1789, being provided for by the great act that established the Federal Courts. In 1870, 22 June, the Attorney-General was made the head of a Department of Justice. Four additional departments have been created as the expansion and progress of the country have demanded. The Department of the Navy was established in 1798, 30 April; the Home Department, popularly called the Department of the Interior, in 1849, 3 March; the Department of Agriculture, in 1889, 9 Feb.; and the Department of Commerce and Labor, in 1903, 14 Feb. Although the Constitution of the United States refers in two places to the heads of departments, it does not imply that they are to form a council to advise the President on questions outside of their respective departments. The distinction between the two functions is illustrated by the following episode. During the interval, 21 Feb.–28 May 1868, Secretary Stanton was on duty at the War Office, while Lorenzo Thomas, who had failed to get possession of the office, was attending the Cabinet sessions. Left without a council by the Constitution, Washington sought one for himself. At first he turned to the Senate. He had Constitutional authority for advising with this body on the two subjects of appointments and treaties. But his visits to the Senate chamber were coldly received. At the same time he singled out certain men whom he consulted as individuals. On 27 Aug. 1790, he formally requested written opinions, on a question of general policy, of Hamilton, Jefferson, Knox, Randolph, Jay, and Adams. These men were respectively the Secretary of the Treasury, Secretary of State, Secretary of War, Attorney-General, Chief Justice and Vice-President. On 4 April 1791, the President addressed a letter to the three Secretaries which brought about the first cabinet councils to which there is any reference. The occasion was his own absence from the seat of government. He herein expressed the wish that if any important cases arose during his absence, the Secretaries of the Departments of State, Treasury and War may hold consultations thereon to determine whether they are of such a nature as to demand his personal attendance at the seat of government. If the Vice-President is at the seat of government, the President wishes that he also be consulted. One or more consultations were held agreeably to this

suggestion. Besides the officers specified, the Attorney General was present. During the year 1792, the three Secretaries and the Attorney-General occasionally met the President at his house for consultation. But it was in 1793 that frequent consultations gave the council a definite place. The circumstance of this was the conduct of Minister Genet. In August of this year, Jefferson referred in his diary to the President's council as «our cabinet.» In the administration of John Adams the word was quite commonly used. It has never been introduced into the laws; but it can be found in the debates of Congress and in the President's messages. The rule that Washington followed in the choice of his counsellors was to summon those officers who filled sufficiently high places in the government, and who held office at his pleasure. Under Jefferson the whole executive body was for the first time at harmony with itself. The cabinet now had five members. For a period of seven administrations it maintained the status of an advisory body which expected to be called for consultation on all important questions, and at the same time had no power to enforce its views upon the chief executive. This was interrupted only by the disorders that resulted from weakness in the War and Navy Departments during the War of 1812. All the Presidents of this period succeeded to that office after being Secretary of State. Moreover, Madison, Monroe, and John Quincy Adams retained in their cabinets a number of their colleagues of the preceding administration. This stability was favorable to the cabinet prestige. Jackson reduced the Cabinet to a more humble status. However, the popular idea of the «Kitchen Cabinet» is a mistake. During the period 1829–31 strained personal relations growing out of a scandal in the family of the Secretary of War made it almost impossible for the six heads of departments to meet together. The Postmaster-General was now included with the others. But it does not appear that the President was at this period guided by the counsels of the editors who had helped to elect and had received positions under the government. He was on most cordial relations with the Secretary of State and the Secretary of War. After the reconstruction of the cabinet, councils were held regularly or at least frequently. In the matter of the removal of the deposits from the Bank of the United States, he acted contrary to the cabinet opinion, and found his chief adviser in Amos Kendall, who is the most remarkable figure in the commonly accepted «Kitchen Cabinet.» It might be expected that a great war would give to the Cabinet an increased importance. This was not the case in the War of 1812 or the Spanish War of 1898. The cabinets of Madison and McKinley did not meet the extraordinary demand upon them with notable strength. But those of Polk and Lincoln profited by their opportunity. The period from Jackson to Polk was one of cabinet debasement. That from Fillmore to Lincoln was one of cabinet ascendency. The executive council now had seven members. It had also begun to meet at regular times. Pierce has been the only President who made no change among the heads of departments during four years. This has been pointed to by Southern writers as proof of great power to control men. But Pierce was led by his council. The Cabinet ascendency culminated under Buchanan. During the last months of his administration, the President was under the dictation of Black and Stanton, the Secretaries of State and War. The high position occupied by the Cabinet during the Civil War was not at the expense of the presidential prerogatives. If Seward and Chase and Stanton were exercising extraordinary powers, Lincoln was doing the same. Indeed he consulted his advisers in the matter of the Emancipation Proclamation only after the document was already composed. The most momentous episode in Cabinet history is Johnson's attempt to remove Secretary Stanton from the War Department contrary to the Tenure of Office Act. This led to the impeachment of the President. Congress repealed the act early in the next administration, thereby acknowledging that it was an encroachment upon the President's rights. Since the reconstruction of the government, the status of the Cabinet has been on the whole as it was before the administration of Jackson. In Cleveland's first administration, the eighth member was added; and under Roosevelt, the ninth. The President's council bears the name of the great executive organ of the British government. But its functions are much inferior. The ministers who compose the British cabinet are members of Parliament. They digest the great bills that are to be introduced, and direct their course in the House of Commons and the House of Lords. Their functions thus combine those of the standing committees of Congress with the direction of executive affairs. Under the American system, the executive officers are rigorously excluded from the floors of Congress. The chief avenue through which the heads of departments can influence legislation is the standing committees. The question of admitting cabinet members to the floors of Congress for the purpose of giving information and of allowing them to participate in the debate of questions pertaining to their respective departments has been before Congress several times. See CABINET; KITCHEN CABINET; UNITED STATES — CABINET OFFICERS, ETC., OF THE.

An account of the way a President transacts business with his cabinet officers is given by President Harrison in 'This Country of Ours' (1901). For remarks by President Hayes concerning the attitude of a President towards the advice of his cabinet, consult Stevens' 'Sources of the Constitution of the United States,' (1894).

MARY L. HINSDALE,
Ann Arbor, Mich.

15. **United States — The Interpretation of the Constitution of the.** The interpretation of the Constitution began even before its adoption. As it came from the hands of the convention it contained no bill of rights. This was made a ground for fierce attack in many of the ratifying conventions. Said Patrick Henry in the Virginia convention: «The necessity of a bill of rights appears to me to be greater in this government than ever it was in any government before. . . . I repeat that all nations have adopted the construction that all rights not expressly or unequivocally reserved to the people are impliedly and incidentally relinquished to rulers as necessarily inseparable from the delegated powers.»

The friends of the Constitution, on the con-

trary, maintained that a bill of rights was neither necessary nor desirable. Said Hamilton in the 'Federalist': "I go further and affirm that bills of rights in the sense and to the extent in which they are contended for are not only unnecessary in the proposed Constitution, but would even be dangerous. They would contain various exceptions to powers not granted, and on this very account would afford a colorable pretext to claim more than were granted."

This argument, however, did not satisfy. Seven of the States at the time of ratifying the Constitution asked for 124 amendments, counting duplicates. Congress paid no attention to these but offered instead to the States 12 amendments for adoption. All but the first two, which were unimportant, were adopted and constitute the first 10 amendments, or Bill of Rights. Theoretically, Hamilton's position is correct, but in view of the wide extent of powers assumed by Congress under the elastic clause of the Constitution, there is no doubt that the adoption of these amendments was a wise act. They at least set limits beyond which Congress may not go. These amendments are limitations upon Congress and not upon the States.

With the adoption of the Constitution began at once discussion as to the character of the government it created. It was known to be a federal government, one wherein certain powers were granted to the general government and all powers not granted were reserved to the States. But the extent of the powers granted and the character of the powers reserved; in a word, the true relationship existing between the states and the general government was not known. Discussion over this question took the form of three great controversies, the subjects of which were: (1) The nature of the implied powers of Congress. (2) The right of a State to nullify and secede. (3) The status of the seceding States after the Civil War.

The question of the nature of the implied power of Congress arose over the attempt of Hamilton to have a national bank incorporated by Congress. Jefferson, then Secretary of State, led the opposition. He argued that Congress had only such powers as were expressly granted or necessarily implied. The necessity, moreover, must be an absolute one. Only such means were granted according to Jefferson "without which the grant of the power would be nugatory." Hamilton, on the contrary, maintained that Congress had three kinds of powers: (1) Those expressly granted. (2) Those implied. (3) Resulting powers; that is, those "arising from the whole mass of the power of the government." Those powers were implied, according to Hamilton, which were "fairly applicable." They need not be absolutely necessary but merely "appropriate and proper." Washington, after reading the arguments of both men, accepted that of Hamilton and signed the bill.

Later in the case of McCullough *v.* Md., the Supreme Court was called upon to decide the constitutionality of the bank. Marshall, in his opinion followed very closely the reasoning of Hamilton. He said: "Let the end be legitimate, let it be within the scope of the Constitution and all means which are appropriate, which are plainly adopted to that end, which are not prohibited but consist with the letter and spirit of the Constitution are constitutional." This question has arisen many times in our history. In 1803 Louisiana was purchased. The Republican party under Jefferson were responsible for the act. Jefferson himself was consistent in that he did not believe that Congress had any power to annex new territory. He therefore asked Congress to propose an amendment granting this power. This not being done, he favored the dangerous doctrine of "shutting up" the Constitution until the annexation should be accomplished. Strange to say the Federalist, or broad construction party, now reversed its position and denied the right of Congress under the Constitution to annex new territory. This is but one of the many examples which testify to the fact that the position of parties as well as of individuals has in our history been often determined by expediency rather than principle.

The Federalists also opposed the embargo acts of Jefferson's administration as being unconstitutional. They distinguished them from their own embargo on the ground that their acts were but temporary and so a regulation of commerce, while the acts complained of were permanent and so not a regulation but a destruction of commerce. One of the chief occasions of this controversy was over the question of internal improvements. This question first seriously arose in Madison's administration when the President, doubting the power of Congress to appropriate money for internal improvements vetoed the "Bonus Bill." Monroe for the same reason vetoed the Cumberland Road Bill, and Jackson the Maysville Road Bill. Jefferson, Madison, Monroe, Jackson and Polk all in messages to Congress asked that an amendment be proposed granting this power. The Whig party all along maintained the constitutionality of such appropriations and such has for a long time been accepted as the true interpretation. The last great occasion for the discussion of the subject was in regard to the issue of legal tender notes by Congress during and after the war. In Hepburn *v.* Griswold the court declared that Congress had no power to make such an issue, but in the Legal Tender Cases this decision was overruled and in Juilliard *v.* Greenman the issue of such notes in time of peace as well as war was upheld. In these last cases the doctrine of implied powers received a broader meaning than had ever before been given to it.

The question of broad or strict construction of the Constitution has been the only permanent dividing line between the great political parties. Other issues have at times arisen and brought into being parties, but they have been but temporary. The reason is simple. Broad or strict construction is the result of a deeper difference; one that exists in human nature. Some men by nature believe in government, in order and system. Such men are nationalists and favor a broad construction of the Constitution. Other men by nature believe in the individual, even at the expense of good government. Such men are particularists and favor a strict construction.

Nullification and Secession.— The Alien and Sedition Laws (q.v.) were passed in June and July 1798, respectively. In protest were passed in November and December 1798 the Kentucky and Virginia Resolutions (qq.v.) which contained at least "the first germ of the doctrine of nullification." The Virginia Resolutions declared:

That this assembly doth emphatically and peremptorily declare that it views the powers of the federal government as resulting from the compact to which the States are parties, as limited by the plain sense and intention of the instrument creating that compact, as no further valid than they are authorized by the grants enumerated in that compact; and that in case of a deliberate, palpable, and dangerous exercise of other powers, not granted by the said compact, the states which are parties thereto, have the right and are in duty bound to interpose, for the purpose of arresting the progress of evil and for maintaining within their respective limits the authorities, rights, and liberties appertaining to them.

The Kentucky Resolutions declared:

That to this compact each State acceded as a State and as an integral party; that this government, created by this compact was not made the exclusive or final judge of the extent of the powers delegated to itself, since that would make its discretion and not the constitution the measure of its powers, but that, as in all other cases of compact among parties having no common judge, each party has an equal right to judge for itself, as well of infractions as of the mode and measure of redress.

Delaware, Rhode Island, Massachusetts, New York, Connecticut, New Hampshire and Vermont responded to these resolutions, all opposing the doctrines laid down. In response Kentucky passed the Resolution of 1799 which said: "That the several States have the unquestioned right to judge of the infraction; and that a nullification by those sovereignties of all unauthorized acts done under color of that instrument is the rightful remedy."

Later it was claimed that these resolutions were authority for the nullification doctrine of Hayne and Calhoun. This is a mistake. Madison in 1831 denied that nullification by a single State was meant. It is true the Kentucky resolutions, and especially those of 1799, are stronger in their language, but though the word "nullify" does occur in these last resolutions, it is not to be done by a single State but by "those sovereignties." The difference between nullification as used by Hayne and Calhoun and as used by Kentucky and Virginia in their resolutions, is that in the former case the right of a single State to nullify subject to the revokal of a three-fourths vote of the States was meant, while in the latter case only the constitutional right of three fourths of the States to act in convention was meant.

Between 1798 and 1832 when South Carolina declared null and void the tariffs of 1828 and 1832, the right of a State to resist the exercise of undelegated power by the Federal government was often asserted. In 1809 the State of Pennsylvania ordered out its militia to resist the enforcement of an order of a Federal court. In 1809–10 the cities and legislatures of New England were a unit in denouncing the Embargo and Force Acts as unconstitutional and in threatening State interposition. In 1814 the Hartford Convention was called to consider what action should be taken to resist the continuance of the war with England. Delegates were present from the States of Massachusetts, Rhode Island, Connecticut, New Hampshire, and Vermont. The convention in its resolutions declared that "it is as much the duty of the State authorities to watch over the rights reserved as of the United States to exercise the powers granted." In words almost identical with those used in the Virginia resolutions it declared that "it is not only the right but the duty of such a State to interpose its authority for their protection." In 1820 occurred the contest between the United States bank and the State of Ohio. The State had levied a tax of $50,000 on each of the branch banks within its jurisdiction, and had by force taken the money from their vaults. The bank sued the officers and won their suit. Ohio in turn protested and "approved the resolutions of Kentucky and Virginia." In 1824 was passed the tariff called the "Woolens Bill." Virginia, North Carolina, South Carolina, Georgia, Alabama, and Mississippi adopted resolutions of protest, laying down again the doctrine that the Constitution is a compact and that there is no common judge. In 1825–6 Georgia successfully nullified the decision of the Federal Supreme Court in regard to her right to exercise jurisdiction over the lands of the Indian tribes within her borders. It was not, however, until South Carolina adopted the South Carolina Exposition written by Calhoun in 1828, that we have an official assertion of the constitutional right of a single State to nullify an act of Congress.

The position taken by Calhoun briefly stated was:

1. The Constitution is a compact to which each State is a party. The General Government is not a party to the compact but an agent thereof.

2. The Constitution gives to the General Government certain sovereign powers, but the exercise of sovereign powers and sovereignty itself are two different things. The States alone are sovereign.

3. When the General Government, or agent, exceeds the powers granted to it, any one of the principals (States) has the right to declare such act void as to itself.

4. The General Government, or agent, may appeal in such case to all the principals. If three fourths of the States, who are the principals, decide that the power in question belongs to the General Government, the nullifying State must yield.

Calhoun denied that the Federal Supreme Court was constituted a tribunal to decide such controversies, because

1. There are many questions which may be matters of dispute, that could not come before the Supreme Court at all, being political in nature.

2. The Federal Supreme Court had already shown its prejudice.

3. The Federal Supreme Court is but a part of the General Government, and to allow it to be the final judge would be to allow the General Government, or agent, to determine the extent of its own powers, and that says Calhoun "would be monstrous and has never heretofore been claimed in similar cases." Calhoun also laid great stress on the argument that in case a State nullified an act of Congress the General Government could not successfully enforce such nullified act by the processes of the courts. In a contest of this kind Calhoun was certain the State must win.

Secession.—The doctrine of nullification and that of secession are not to be confounded. One does not necessarily go with the other. While more destructive than that of nullification, the doctrine of secession is nevertheless more logical and consistent. It follows directly from the compact theory of the Constitution. It is one thing to say that a sovereign State which is a party to a compact may, when it sees fit, with-

draw from the compact. It is another thing to say that such State may remain in such compact, receive the benefit of it and yet refuse to be bound by it. There were, therefore, many who believed in the right of secession, who denied the right of nullification. Said Jefferson Davis in his farewell speech in the Senate: "I hope none who have heard me will confound this expression of mine with the advocacy of the right of a State to remain in the Union and to disregard its constitutional obligation by the nullification of the law. Such is not my theory. Nullification and secession, so often confounded, are indeed, antagonistic principles."

The Civil War settled forever the question of nullification and secession. Said the Supreme Court in Texas *v.* White in 1868: "The Constitution in all its provisions looks to an indestructible Union composed of indestructible States. When, therefore, Texas became one of the United States she entered into an indissoluble relation. . . There was no place for reconsideration or revocation except through revolution or the consent of the States." The Civil War, however, did not settle the question of the true relations between the States and the Federal Government. At the conclusion of the war the North was in an anomalous position. It had denied the right of a State to secede. It had denied the validity of acts of secession. The South, being beaten, accepted for its own purposes this reasoning, and demanded that the seceding States be given all the rights of States, such as representation in Congress and the right to exercise all the power reserved to the States. This the North was unwilling to do, but insisted rather that though States they be denied the rights of States until reconstructed. There were five theories advanced as to the status of the seceding States after the war.

1. The Southern theory which claimed, as stated above, that the seceding States were entitled to all the rights of States.

2. The Presidential theory which claimed that the States were the same as always. The only offense committed was by disloyal individuals within the States. It was therefore a question for the President to settle through the exercise of his pardoning power.

3. Conquered Territory theory, which held that the war had temporarily broken all the bonds between the United States and the seceding States and that they were as conquered foreign territory.

4. State Suicide theory, which was that the States had by seceding committed suicide and were again territories, under the plenary power of Congress.

5. Congressional theory, which was that the acts of secession were void and unavailing to take the State or people out of the Union. Nevertheless the States had by such act forfeited their rights under the Constitution and lost their status as "States." They remained, according to this theory, in this condition until Congress in its discretion, acting under its power to guarantee to the States a republican form of government, should admit them again to the full status of "States."

This was the theory under which Congress acted in its Reconstruction policy. The constitutionality of the Reconstruction Acts was never directly passed upon by the Supreme Court. A case was before it once involving this question, but before a decision was reached the jurisdiction of the court in the case was taken away. In Texas *v.* White and White *v.* Hart, however, the court, though specifically refusing to pass upon the constitutionality of the various Reconstruction Acts, did practically declare sound the Congressional theory, when it said: "These new relations imposed new duties upon the United States. The first was that of suppressing the rebellion, the next was that of re-establishing the broken relations of the State with the Union. The authority for the performance of the first had been found in the power to suppress insurrection and carry on war; for the performance of the second, authority was derived from the obligation of the United States to guarantee to every State in the Union a republican form of government."

The nature of the government created by the Constitution is then a settled question. The Civil War not only destroyed the doctrine of State sovereignty, but made unpopular any assertion of the doctrine of State Rights. The doctrine of implied powers, as laid down by Hamilton, is now accepted without dispute. The danger is that in this emphasis of the powers of the General Government, the powers of the States will be forgotten and overridden. This is the great question of interpretation for the future. See also CONSTITUTION OF THE UNITED STATES.

ALONZO HUBERT TUTTLE,
Professor of History, University of Ohio.

16. United States — The Alien and Sedition Laws of the. Alien and Sedition Laws, in the political history of the United States, were four laws passed by the Federalist party in Congress, June and July 1798, during President Adams' administration. These laws gave rise to the first nullification proceedings in the South, namely, the Kentucky Resolutions (q.v), passed in November 1798, and the Virginia Resolutions (q.v.), passed in December 1798, and resulted in the final defeat of the Federalist party. The Federalists, who had controlled the government from its very inception, resented all hostile criticism of their conduct of national affairs and spurned the charge made by the Republicans that the Federalists were strongly inclined toward England and were trying to embroil the American nation in a war with France. Especially obnoxious to them were the embittered exiles who had been flocking to the shores of America from 1790. These exiles, who were French sympathizers, and, therefore, affiliated with the Republican party, attempted to create sentiment in favor of France, thus blocking the way of the Federalists, who desired to punish France for her outrageous attacks on American commerce and for her hostile attitude to the United States after the conclusion of the Jay Treaty. Moreover, by obtaining control of journals here and there throughout the country, or by establishing sheets of their own, they would publish scurrilous and offensive attacks upon the ruling party of Federalists, which the latter felt very keenly.

In 1797, the Federalists had a majority in the Senate, but the House was Republican. Therefore, the measures for defense against French aggression, which the Federalists at-

tempted to pass, were all defeated by the Republican majority in the House. But the timely publication of the "X. Y. Z." correspondence (q.v.) showing the scandalous conduct of Talleyrand and the French directory produced such an outburst of popular indignation against France throughout the entire country that the defenders of France were completely silenced, and even the moderates, who had sided with the Republicans, went immediately over to the support of the Federalists. The popular demonstration appeared to furnish a complete vindication of the course of the Federalists, who gained control of both houses and now were supreme. No sooner had they secured entire control of the reins of government than they began to carry out their party programme of suppressing all hostile criticism of the Federal administration, even at the risk of stifling liberty and freedom of speech.

Accordingly, in 1798, the Federalists enacted three laws concerning aliens: (1) The new naturalization act, passed 18 June; (2) the alien acts, passed 25 June; (3) the sedition act, passed 6 July. The new naturalization act prolonged the requisite term of residence before naturalization from 5 to 14 years, and the term after declaration of intentions from 3 to 5 years; denied alien enemies naturalization, and required all white aliens to be registered on arrival, under penalty, and such registry to be the only proof admitted on application for naturalization. The alien act authorized the President, for the next two years, to order out of the country any aliens whom he thought dangerous or engaged in conspiracy. Any alien thus notified who should be found at large without the President's license might be imprisoned for three years, and could never thereafter be admitted to citizenship. The sedition act empowered the President to arrest or deport all resident aliens when war was declared against the United States. As finally approved by the President, the first section of the sedition act made it a high misdemeanor, punishable by a fine of $5,000 and five years' imprisonment, for persons unlawfully to combine and conspire to oppose any measures of the government directed by proper authority, or to interfere with the operation of any law of the United States, or to intimidate any person from accepting or holding Federal office, or to commit, advise or attempt any insurrection, riot, or unlawful assembly. The second section prescribed that the writing, printing, or publishing of any false, scandalous and malicious writings against the government of the United States, or either house of Congress, or the President, with the intent to defame or bring any of them into contempt or disrepute, or to arouse against any of them the hatred of the good people of the United States, or to stir up sedition within the United States, or to excite any unlawful combination for opposing or resisting any law or lawful executive act, should be punished, on conviction before the United States court having jurisdiction, by a fine not exceeding $2,000 and imprisonment not exceeding two years. The third section provided that the truth of the matter contained in the publication might be given in evidence as a good defense, the law and fact under the court's direction to be determined by the jury. A clause added by Bayard of Delaware limited the term of operation to 4 March 1801, so that it should expire with the Federalists if they should lose in the succeeding presidential election and the Republicans should not have the credit of repealing it.

These acts were denounced by the Republicans as being in opposition to the Constitutional rights of the States to permit such immigration as they chose up to the year 1808 (specifically applicable to slaves), as assuming national powers over persons under the jurisdiction of their States and as violating the general right of trial by jury. On these points the laws were attacked by the Kentucky and the Virginia resolutions, which Jefferson and Madison drew up, and which suggested nullification as the proper remedy.

The alien and sedition laws were obnoxious to the Republicans, not so much on the ground that they were inimical to civil liberty, but rather because they were regarded by that party as an encroachment upon the principle of States' right. It is this aspect of the laws that gives them their chief interest and importance. The alien law, it is to be observed, was not enforced, nor would it have produced much disturbance among the Republicans if it had been strictly enforced. But the sedition act, which cut very near the root of civil liberty and was contrary to the underlying principle of American institutions, was enforced, since at least six prosecutions took place under it and Judge Chase invoked its authority for his scandalous partisan decisions. Upon the accession of the Republicans to power, these odious laws either expired by limitation or were repealed.

EDWIN W. BOWEN,
Department of Latin, Randolph-Macon College.

17. United States — Judiciary of the. In the colonies the courts consisted of judges appointed, save in Connecticut, by the crown or by its representative, the governor of the colony. In the beginning, in some of the colonies, appeal lay from these courts to the General Assembly. In many of the colonies the governor's council, which was the upper legislative body, was also the highest court, and in all of the colonies appeal could be had to the King in Council. Acts of the Colonial Legislature which were repugnant to the laws of England or to the charter were void. Winthrop *v.* Lechemere is one of the very few cases where a colonial statute was declared void by the Privy Council as being contrary to the laws of England. Under the Confederation there were three courts that were, in a way, Federal. (1) Congress by an "especial process" was given power by the Articles to determine disputes between States as to "boundary, jurisdiction, or any cause whatever." Congress was called upon to exercise this power but three times,—the most important one being the dispute between Connecticut and Pennsylvania in regard to the "Wyoming" territory. (2) Congress could appoint "courts for the trial of piracies and felonies committed on the high seas." State courts were used for this purpose. (3) Courts of Appeals in Cases of Capture.—This was the only permanent Federal court and is important, since it was the "predecessor" of the Supreme Court. Some 118 cases were tried before this court, among them being the famous

Olmstead case. "It could hardly be," says Prof. Jameson, "that so many cases should be brought by appeal from State courts to a Federal tribunal, without familiarizing the public mind with the idea of a superior judicature in Federal matters, exercised by Federal courts. The court of appeals in cases of capture may therefore be justly regarded not simply as a predecessor but as one of the origins of the Supreme Court of the United States." This statement is thought by some to be too strong, especially in view of the fact that not once was this court referred to in the Federal convention.

The need of a Federal judiciary was recognized as a paramount one by every member of the Constitutional Convention. It was a part of every plan introduced. On 14 June the convention agreed *nem. con.* to the first clause of the ninth resolution of the Virginia plan, which read "that a national judiciary be established." In regard to the details there was great difference of opinion as to three points. (1) Should inferior courts be provided for. (2) How should the judges be appointed. (3) What should be the jurisdiction of courts created.

At first, the convention decided that the "Federal judiciary should consist of one supreme tribunal and one or more inferior tribunals." Almost immediately "one or more" was struck out. Rutledge, among others, objected to the creation of inferior courts, holding that the State courts should be used instead. Madison and Wilson argued strongly for the necessity of inferior Federal courts. A compromise was reached by providing that Congress might create them if necessity occasioned. This clause was probably the ground of the most bitter attack made on the Constitution in the ratifying conventions called by the States. They saw in it the complete destruction of the power of the State judiciary.

In regard to the appointment of the judges the greatest discussion took place. At first it was decided that the national legislature should appoint, then it was changed to the Senate, and finally, at the very end of the convention, the report of the "Committee on Unfinished Portions," putting the appointment in the hands of the President, by and with the advice and consent of the Senate, was adopted.

The question of jurisdiction was one full of difficulty and it is doubtful if, when they were through, the convention fully realized the great power they had given to the federal judiciary. At one time it was decided that the jurisdiction of the national judiciary should extend "to the trial of impeachment of officers of the United States," but this was later omitted. It was not until late in the convention, 27 Aug., that on motion of Dr. Johnson the jurisdiction was extended to cases arising under the constitution and on motion of Rutledge to cases arising under treaties.

As finally adopted the constitution provides for two kinds of jurisdiction for the Supreme Court: original and appellate. It has original jurisdiction in all cases affecting "ambassadors, other public ministers and consuls, and those in which a State shall be a party." Its appellate jurisdiction is within the control of Congress and was largely fixed by the Judiciary Act of 1780.

In the beginning the Supreme Court was weak and gave little promise of its present power. When appointed a second time as chief justice, Jay declined because he was "perfectly convinced that . . . it (the Supreme Court) would not obtain the energy, weight and dignity which was essential to its affording due support to the National Government; nor acquire public confidence and respect, which as the last resort of the justice of the nation it should possess." To-day the Supreme Court is without question the most august tribunal in the world. Its great power has come from the fact that it has maintained the right to declare void as unconstitutional Federal and State statutes. The origin of this power is a matter of controversy. It is claimed by some to be expressly granted by the constitution, and to have been so intended by the "Framers." There is no doubt that some members of the convention were of the opinion that the constitution as adopted did confer this power. Gerry, Gouverneur Morris, Sherman, Wilson, Mason and Luther Martin expressed themselves in the convention to this effect. It is doubtful, however, if very many members believed, or at least realized, that such was the case. No one protested when Mercer and Dickinson declared that no such power should belong to the courts. Madison himself insisted that Congress be given the power to negative acts of the State legislature, on the ground that otherwise there would be no check upon the power of the States to pass laws contrary to the Federal constitution. Another view is that this great power, though not expressly granted, is implied from the fact that the constitution is the supreme law of the land and the courts must apply the law. When therefore there are two laws like the constitution and a Federal or State statute contradicting one another, both applicable to a given set of facts, the court cannot apply both, but must reject the statute and apply the constitution, for this is the supreme law. There are a number of cases where the State courts asserted this right before the adoption of the constitution. In 1780 the court of New Jersey is said to have declared its right to pronounce unconstitutional acts void. In 1782 in Commonwealth *v.* Caton, Justice Wythe of the Virginia court in strongest language declared that "if the whole legislature should attempt to overleap the bounds prescribed to them by the people, I, in administering the public justice of the country, will meet the united powers at my seat in this tribunal, and pointing to the constitution will say to them, here is the limit of your authority and hither shall you go but no further." In Bayard *v.* Singleton, decided in North Carolina in 1787, an unconstitutional act was declared void, and about this time according to a letter written to Jefferson by J. B. Cutting, the Massachusetts Supreme Court pronounced void a statute in that State. Rutgers *v.* Waddington decided in 1794 by the Mayor's Court in New York and Trevett *v.* Weeden, decided in 1786 by the Supreme Court of Rhode Island, are often cited as instances of the same kind, but upon examination will be found to have involved different considerations. The principle therefore was not entirely new when the Federal Supreme Court began its work, but it was by no means a generally accepted principle. In 1800 in Cooper *v.* Telfair, the Supreme Court itself expressed its doubt upon the matter. It was not until 1803 when

Marshall read the opinion of the court in Marbury *v.* Madison that the question was definitely settled. Congress had conferred upon the Federal Supreme Court original jurisdiction in regard to writs of mandamus. Acting under this law, Marbury petitioned the court to grant a writ commanding Madison, the Secretary of State, to deliver to him his commission of office, he being one of Adams' midnight appointees. The court refused to issue the writ. It conceded that Madison, though Secretary of State, might be compelled to perform such a ministerial duty, but it denied that it had any original jurisdiction in the matter. The constitution having defined the original jurisdiction of the court, such definition was exclusive and any act of Congress adding thereto was contrary to the constitution and therefore void. This decision became at once the accepted rule and has been followed almost without question ever since. The reasoning of Marshall in this case is luminous and justly famous, but possibly it has been given greater praise than is due. The dissenting opinion of Justice Gibson of the Pennsylvania Supreme Court in Eakin *v.* Raub (12 S. and R. 330) in which opinion he denies the right of the State Supreme Court to declare void, as unconstitutional, a State statute, is considered by Prof. Thayer to be an abler argument on the subject than that of Marshall.

The history of the Supreme Court naturally falls into four periods: (1) Prior to John Marshall's appointment. (2) Marshall as Chief Justice. (3) Taney as Chief Justice. (4) From Taney to the present time. During the first period which extends from 1789 to 1801 Jay and Ellsworth served as Chief Justice. Rutledge and Cushing were appointed during this time to this position but the former failed of confirmation and the latter refused to accept. Jay also refused a second appointment. During this period six constitutional cases were decided, the most important being the case of Chisholm *v.* Georgia, wherein the court declared its right to entertain a suit against a State. The States took great offense at this decision and as a result the 11th amendment was adopted. Though the volume of business done was small, this period was not unimportant, for at this early day the court gave to the constitution that nationalistic interpretation which prepared the way for Marshall. "The real importance," says Judge Cooley, of the Supreme Court, "was never greater than at first."

In the period of Marshall's chief justiceship the court was lifted to its present strong position. Though not so learned in the law as either Story or Taney he was superior to both in his matchless power of analysis and logic. During his 34 years of service as Chief Justice 1,116 decisions were handed down. Of these Marshall wrote 519, the remainder being divided among the 15 associate justices who sat on the bench during that time. Marshall was a strong Federalist and, carrying his court with him, gave to the constitution that broad national interpretation that has made possible the later development of the nation. During this period four great principles were established. (1) The right of the Federal Supreme Court to declare void a Federal statute. (2) The right of the same court to hear cases on error from a State Supreme Court. (3) The principle of the implied power of Congress. (4) The right of the Federal Supreme court to declare void a State statute. The first principle was established in 1803 in Marbury *v.* Madison. The second was established in 1816 in Martin *v.* Hunter's Lessee and again in 1821 in Cohen *v.* Virginia. The doctrine that Congress has not merely the powers expressly granted and those implied by absolute necessity but as well all other powers not forbidden by the spirit or the letter of the constitution, which are appropriate and plainly adapted to the carrying out of the express powers, was laid down in 1819 in McCulloch *v.* Maryland and again in 1824 in Osborn et al *v.* the Bank of the United States.

The right of the Federal Courts to declare void a State statute, as contravening the Federal constitution was determined in 1810 in Fletcher *v.* Peck, in 1819 in the Dartmouth College case, in 1824 in Gibbons *v.* Odgen, in 1850 in Craig *v.* Missouri, and in many other cases since.

The period of Taney is the period of reaction. Five judges were appointed in the last ten years of Marshall's term. Four of these had little sympathy with the nationalistic theories of Marshall. Toward the end, the court several times refused to hand down a decision, without a rehearing, owing to division among the judges. In 1845–6 three new vacancies were filled by Democratic appointees and by 1861 the court was solidly Democratic. The tendency during this time was toward a stricter construction of the constitution and an extension of the powers of the States. The change in the character of the court was evidenced soon after Taney's appointment in the decision in Briscoe *v.* Bank of Kentucky, handed down in 1837, wherein the court, departing from the former decision of Marshall, declared that bank notes issued by a State bank of which the State was the sole stockholder were not bills of credit within the meaning of the Federal Constitution. The leading case during this time is the Dred Scott case (q.v.), wherein the court went outside the case to declare unconstitutional the Missouri Compromise. The reputation of Taney has suffered much from this decision, and doubtless had he not been so old and infirm he would never have been persuaded into committing this error. Taney was, however, honest in this opinion and as a Chief Justice in ability and influence he ranks second only to Marshall.

Since Taney's death there have been three chief justices: Chase (1864), Waite (1874), and Fuller (1888). Under Republican administrations the character of the court has again been changed and has come again to the position of Marshall. Immediately after the Civil War Congress was afraid of the court and so took away its appellate jurisdiction in certain cases then pending before it, so as to prevent its passing upon the constitutionality of the Reconstruction Acts. They had no reason for their fear, however, for the court in Texas *v.* White accepted in full the right of Congress to "reconstruct." After the court in 1870 had declared in Hepburn *v.* Griswold that the issue of legal tender notes by Congress was unconstitutional, the court was reorganized. One member resigned, the court was increased in size by one, so two judges, Bradley and Strong were appointed by President Grant. It was charged and generally believed that the court was "packed" to bring about a reversal of the Legal Tender de-

cision, but much effort has been made by some, notably Senator Hoar, whose brother was Attorney General at the time, to prove that this was not so. Many of the important decisions of the court during this period have been concerning the interpretation of the 14th amendment. In interpreting the clause which provides that "no State shall make or enforce any law which shall abridge the privileges or immunities of citizens of the United States," the court in the Civil Rights cases put a salutary check upon the rapidly increasing power of the Federal Government by deciding that the General Government has no power to protect the individual in his civil rights, this being still a function of the States. The clause which forbids a State to " deprive any person of life, liberty or property without due process of law" has been most prolific of litigation and will doubtless continue to be so for a long time to come. The court as constituted in 1904 consisted of the following judges: Fuller, Chief Justice, (1888); Harlan (1877); Brewer (1889); Brown (1890); White (1894); Peckham (1895); McKenna (1898); Holmes (1903); Day (1903). See SUPREME COURT.

ALONZO HUBERT TUTTLE,
Professor of History, University of Ohio.

18. United States — Diplomacy of the. No complete history of the diplomacy of this country has ever been written. Much of its diplomatic effort has been spent upon private claims and national affairs of a commercial rather than a political character. A history of these would be dull reading indeed. Moreover it must be confessed that, for long periods in our national life, our country played but an inconspicuous part in the world's politics, and upon such periods the historian must touch but lightly. To sketch the diplomacy of a century and a quarter, observing a proper sense of proportion; to trace the growth of policies, which have marched with the nation's growth; to characterize treaties which are the crystallized results of diplomacy; yet withal to keep within the narrow limits of a review such as this; such is the aim of this article. The treatment of the subject chosen is partly by periods and partly by topics, the latter where it is desirable to show the continuous growth of a policy or the history of a negotiation running over many years.

The French Alliance, 1778.—How to get military supplies and aid; how to win a standing among nations; these were the problems which the men of the Revolution had to face. The difficulties were tremendous. No foreign state was in political sympathy with the colonies. Recognition of their independence meant war with Great Britain. The only string to play upon was hostility to Great Britain. The only states likely to feel such hostility were Spain — on account of Gibraltar — and France, driven out of Canada by the English only 15 years before. Secret aid had been sent by France in 1776 and 1777 to keep the struggle alive, but open aid was dangerous, unless the colonies showed ability to hold their own. Thus the diplomatic situation waited upon the military one. The success at Saratoga was the turning point. Not in itself but in its consequences it was one of the great battles of the world. For after that the Comte de Vergennes threw off the mask, made treaties of commerce and alliance, thus recognizing the infant state, sent money and aid openly, and accepted the consequence — war with England. In all this Franklin was the influential factor. His fellow commissioners, Deane and Lee, were inferior men. Their instructions from Congress were impossible, to seek recognition, commercial privileges and aid, without reciprocal military engagements. By departing from these, they secured a liberal commercial treaty and a military alliance, binding until the independence of the colonies was secured, peace to be made jointly with the common enemy. These treaties did very much to accomplish American independence. Spain, though in nominal alliance with France, actually gave but trifling help.

The Treaty of Peace, 1782.—There had been overtures and negotiations looking toward peace in 1778 and 1779, but not on the basis of a prior recognition of American independence which the colonies deemed essential. In 1781 various agents to foreign states were united as commissioners, with full power to treat with Great Britain. These were Franklin, Adams, H. Laurens and Jay. Of these Franklin alone had faith in the sincerity of the French government. A change in the British ministry in the spring of 1782, Lord North going out, made negotiation easier. The chief points at issue were: (1) the boundaries; (2) the northern fisheries; (3) the confiscated estates of loyalists. Spain intrigued with France against the Mississippi as our western boundary, desiring to confine the new state to the region east of the Alleghanies. But by the westward migration into the Ohio which was already in motion, this was made impossible. In the northeast the Penobscot and Saint John rivers had been urged as boundaries, and a compromise, the Saint Croix, adopted. New England regarded the enjoyment of the fisheries of the Gulf and Banks as essential to her prosperity. Against the covert opposition of France and the indifference of the South, she stoutly held out for large fishing liberties and got them. Full restoration of confiscated estates by the new government was a financial impossibility, was physically difficult, was negatived by the fortune of war. The utmost that Great Britain could wring from the Americans was a treaty provision that Congress should recommend to the States restitution and compensation to the purchaser for value. This was, and probably was intended to be, a nullity. But it was coupled with the welcome proviso that debts should be collectible and further confiscations stopped. This treaty was provisional, and made without Vergennes' knowledge (which was a violation of instructions), so great was the distrust of France by Adams and Jay. It was put into definitive shape the next year, 1783, with French consent and in compliance with Article VIII of the treaty alliance of 1778. This treaty of peace was a diplomatic triumph for the United States.

Attempts to Secure Recognition From Other Powers.—Although Spain was in alliance with France, the ally of the colonies, she added little weight to the coalition, was unfriendly and tricky, feared the result of American independence upon her own possessions, and made no treaty with the United States until 1795. Tuscany and Austria also refused a treaty on the plan voted by Congress and accepted

by France, as did Prussia, whose timid king, without a navy, saw no chance of maintaining intercourse should it be established. Congress was ready to accede to the principles of the armed neutrality of 1780, but was not permitted by Russia, its originator. The Netherlands joined this neutral league in spite of British threats. This, with the exposure of an incipient negotiation with the colonies, led England to declare war against her in 1780.

The Establishing of Commercial Relations.— This was of the first importance to the new state. Its foreign trade was then relatively more important than now. The French treaty was the only commercial treaty existing until the very close of the Revolution. Decentralization, under the Articles of Confederation, was a serious handicap in negotiating, for it weakened the trade privileges to be offered. After sturdy persistence, John Adams had secured a treaty in 1782, from The Netherlands, much on the lines of the treaty with France. Both of these treaties, in the freedom of neutral trade, in the regulation of search, in the definition of contraband and the opposition to privateering, were liberal, and show the influence of Franklin. He also shared in the negotiation of two other treaties of amity and commerce, with Sweden in 1783 and Prussia in 1785, both containing much the same features as the earlier ones, and displaying the same enlightened characteristics. Spain came into line in 1795, her treaty restating our southern boundary also, and in 1799 the expired treaty with Prussia was revived with some changes, due to war time. Jay's Treaty with Great Britain in 1794, was very much more than a treaty of commerce. How it dodged and how it settled many outstanding difficulties will be seen presently. But as a commercial agreement, its unlikeness to the others enumerated must be recognized. For in it, England, the foremost maritime state, did *not* grant that free ships made free goods, did not like Prussia allow pre-emption of all contraband articles except provisions, but permitted trade without discrimination, admitted consuls, and inserted the earliest of our extradition agreements. Upon the basis of these commercial treaties this country's foreign trade was built up, and much of its prosperity was founded. This is too apt to be overlooked.

Treaties With the Barbary Powers, 1787–1805.—This is a curious chapter in American diplomacy, but must necessarily be brief. Like every state trading along the Mediterranean, our own country was forced to pay tribute, to avoid the seizure of its ships and the enslavement of its citizens by the African corsairs. The alternative was to convoy our vessels, to put them under foreign protection, or to establish immunity by successful war. The treaties with France 1778 (Art. VIII.), and with The Netherlands 1782 (Art. XXIII), promised us the diplomatic aid of those countries against the Barbary powers, while both Portugal and Spain on occasion helped our crews. In 1784, Congress authorized direct negotiation, the commissioners being Adams, Franklin, and Jefferson. Of these Jefferson preferred war, while Adams thought tribute the less expensive way. They tried to bring about concerted action with other states but failed. Then through an agent they dealt directly with Morocco in 1787. This treaty regulated commerce, forbade enslavement of prisoners, and allowed partial consular jurisdiction. It promised no tribute but seems to have needed occasional liberal "presents" to be operative. In the next decade treaties were made with Algiers, 1795, carrying 12,000 sequins annually; Tripoli, 1796, with a lump sum of tribute agreed to (Art. X.); Tunis, 1797, $107,000; the three costing us for their execution some $2,000,000. They contained some curious and some very modern provisions, but were alike in forbidding the enslavement of Americans. There were disputes, armed clashes, but nevertheless tribute, until Decatur wiped out the system and the shame in 1815.

Neutrality and Its Difficulties, 1793–1812.— Except for the Civil War, this was perhaps the most critical period in the history of the republic. Gratitude to France, the surviving bitterness toward England, many grievances left by the war and still unsettled, all these inclined the United States towards the French side in the Wars of the Directory. Such aid upon the sea might well be of vital importance. To secure it Genet was sent by France as minister. But he found Washington resolved upon neutrality as the only safe course. Maritime war with England would have destroyed our commerce and thrown our affairs into fatal confusion. Neutrality meant a breathing spell. Angered by this, Genet tried to compromise our performance of neutral duties in every way until withdrawn at the close of 1793. (See INTERNATIONAL LAW.) Opposition to Washington's course, shared by Jefferson and his followers, gradually built up political parties. Besides old grievances against Great Britain, there were newer ones, which the war with France led to, impressment of seamen from our ships, for instance (see IMPRESSMENT), and the ruin of our trade with the continent in breadstuffs, by an order making them contraband. A commercial treaty was also badly needed. In 1794, John Jay made the treaty which settled all these points, but only by leaving some of them out. It contained our first extradition agreement. It admitted us to the East and West Indian trade under conditions. It framed a list of contraband. But in it Great Britain did not renounce impressment. Jay's treaty was ratified in spite of a storm of abuse and opposition, and helped American trade immensely in the years to come. Our relations with England and France were like buckets in a well. As friendship with one grew, with the other it waned. So now France began to seize vessels and property, under any or no pretext. When Pinckney went to Paris to remonstrate in 1796, he was rebuffed. Humiliating negotiation went on nevertheless, in 1797, three commissioners being sent instead of one. A national loan and individual bribes were demanded by Talleyrand as a condition of negotiation. It was then that the curious episode of the X. Y. Z. Correspondence (q.v.) occurred. Thus this mission was as fruitless as the other had been. Yet a third one was sent, by Adams, to the dismay of the Federalists, and was lucky enough to profit by the revolution of 18 Brumaire 1799, which made Napoleon first consul. For now France contemplated a commercial league against England, and was ready to negotiate. The treaty of 1800 was the result. This did not pay for French

spoliations (that was arranged in 1803), but relieved the United States of the various embarrassments of the 1778 treaties, while restating many of their provisions. This treaty was another valuable step forward. But after an interval of calm, impressment became again active, and various outrages were committed by British ships of war off our own coast. All this was dwarfed, however, by the extensive and illegal paper blockades (see INTERNATIONAL LAW) with which the combatants fought to the injury of the neutral. Our reply was an embargo (see EMBARGO), and useless negotiations with both countries. England's obstinacy and Napoleon's duplicity, coupled with the ardor of our own South, forced us into the ill-judged War of 1812. In spite of all the hampering restrictions of this period, our foreign trade increased largely. Neutrality as established by Washington meant national salvation.

Boundaries and Territorial Growth.—The diplomatic processes which have built up our present limits, out of a country bounded west by the Mississippi and void of Florida, are lengthy and important. But the barest outline can be given here. They consist of (1) boundary adjustment; (2) territorial acquisition; the two often mingled. The first stretch of line, the Saint Croix River, was in dispute as early as 1783, but definitely identified in 1798. The next piece was to run north to certain "highlands," which we placed near the Saint Lawrence, but Great Britain laid down across the heart of Maine. Much disturbance arose in this vast wild region, the scene in 1839 of what is known as the Aroostook War. In 1842 it was divided by the Ashburton Compromise, on the line of the Saint John River, the Saint Francis and a range of hills. From the source of the Connecticut to the Lake of the Woods, the differences have not been serious. West of the Lake of the Woods, after the Louisiana Purchase, the line ran along the 49°, but halted at the Stony Mountains until 1846, when it was carried forward to the Gulf of Georgia, studded with islands. There are two ship channels through this archipelago, one of which (the Canal de Haro) after more long years of controversy was designated as the treaty channel, by the Emperor of Germany, arbitrator, in 1873. Meanwhile Alaska had been purchased from Russia in 1867, and here, too, were disputed boundaries. The Canadians desired a harbor on that coast, and interpreted the treaty so as to draw the line 10 leagues back from the coast, crossing some fjords, not going around their heads. But this was denied by the commission which decided the boundary in 1903. (See ALASKAN BOUNDARY COMMISSION.) The Mexican boundary is partly an artificial, partly a riverine one. The Rio Grande is a shifting stream and the Arizona boundary marks have a way of disappearing, so that to this day occasional diplomatic adjustments of the line are necessary. The chief acquisitions of territory prior to 1899, have been by the purchase of Louisiana, 1803; of Florida, 1819; of Alaska, 1867, and by the annexation of that vast region southwest of Louisiana which the Mexican War brought. Each of these events should be studied under its own title. Of their diplomatic aspects but the slightest review can be given here. A long controversy with Spain over the free navigation of the Mississippi to the Gulf, with the right to transship, made it perfectly clear that our West would insist upon these privileges. French ownership of Louisiana, 1800, was far more dangerous than Spain's could be. The sale of Louisiana, 1803, though earnestly desired by the United States, was effected by Napoleon's naval and financial weakness and change of plans. (See LOUISIANA PURCHASE.) Louisiana was a terribly ill-defined region and naturally capable of being stretched. In the far Northwest this process was aided by Gray's discovery of the Columbia, 1793; Lewis and Clark's exploration in 1804–5; Astor's trading-post at its mouth, 1810, and by the Spanish cession of rights on the Pacific (Art. III., Treaty of 1819). But the rights so derived were vague at best; the title to the Oregon country was left by treaty for many years in abeyance, and that splendid region finally won by the influx of settlers. Spain, in Florida, for years kept the inevitable at bay with the sole weapon of delay. Finally, in 1819, upon the assumption of our citizens' claims against Spain, up to $5,000,000, the cession of Florida was agreed to. (See FLORIDA.) The territory gained by the Mexican War was partly seized, partly paid for. That war was necessitated by the annexation of Texas, to which Mexico still laid claim and with which she was still at war. (See MEXICAN WAR.) The Gadsden Treaty of 1853, by purchase, enlarged this territory.

The Monroe Doctrine and Its Development.—This policy was based on the right of self-defense. It has never given the United States rights not otherwise existent. With much of truth it has joined much of indefiniteness; to the genuine principle of self-defense it has joined this paradox, that the stronger the nation grew and the less it had to fear, so much the broader grew the doctrine in its application. Throughout the diplomacy of the past 80 years, this doctrine runs like a thread. Towards Cuba and Hawaii, as well as towards South and Central America, it was the determining factor in the national attitude. No native politician can live without accepting it; our foreign neighbors, at one time or another, have for the most part grudgingly submitted to it. Originally it announced three things: that no colonization on this continent by a foreign power would be suffered; that the United States would take no part in European politics; that European intervention, to control the form of government of an American state against its will, would not be tolerated, because it was dangerous to our peace and safety. The first principle was aimed at Russia; the last at the Holy Alliance. This Monroe Doctrine was enforced on its original lines as late as 1865, against French intervention in Mexico. (See MEXICO.) In and out of Congress it was deemed applicable in a broader way, to limit French control of De Lesseps's Panama Canal, in the period subsequent to 1880. With a scope still further enlarged, it was used by President Cleveland in 1895, to curb Great Britain in her boundary dispute with Venezuela. And now it is within bounds to say that the old policy tends to become a new one, "America for Americans," the freedom of this continent from European sovereignty and control. See MONROE DOCTRINE.

Relations With Spanish-American States.— Our diplomacy in this direction has been concerned mainly with such matters as (1) protection from foreign aggression, as of Venezuela from her creditors, in 1903; (2) pressing private claims; (3) exercising an indefinite kind of police power to keep order; (4) rarely trying to bring about unity of feeling and action in various directions, as in the two Pan-American and earlier congresses. The various factors which complicate the situation are: chronic revolutions, lack of security to the persons and property of foreigners resulting, defaulted national debts, redress claimed by other powers, jealousy of the United States, lack of consideration and of understanding on the part of the United States, a theoretical but not very active republican tie of sympathy. The natural desire of foreign powers is to collect debts or secure redress by force, and if this is prevented by the United States, to make this country responsible. Our problem is to exercise the control which our position on the continent demands, with no assumption of responsibility for the acts of our neighbors. Somewhere between these positions there must be a line drawn; to find it requires a nice diplomacy.

The Slave Trade and the Right of Search.— For nearly 70 years the right of search was a burning question with England in one form or another. The key to the difficulty was the painful recollection of British impressment practice. That was an attempt to enforce a municipal law on a foreign ship on the high seas, that is, within another state's jurisdiction. It was not formally surrendered; it was disused. Early in the 19th century began the anti-slave trade agitation in England, perhaps a unique example of national altruism. To be made effective, this movement needed a universal right of search on suspicion of slave trading, to be exercised by the war ships of one or more states. By treaty with several powers, Great Britain gained this right, but in the case of the United States the memory of impressment made this later exercise of search too unpalatable. Hence, of course, slavers would try to screen themselves by a false use of our flag. To meet this Great Britain set up two new theories. One was, 1810, that since American statutes forbade our citizens to trade in slaves, English ships and courts might enforce this prohibition — an absurdity. The other, about 1840, claimed a right of visit (of a foreign ship at sea in time of peace) as distinct from a right of search, which was denied by Mr. Webster and surrendered by Lord Aberdeen in 1859, after years of exasperating cntroversy. (See INTERNATIONAL LAW.) In 1842, by treaty, the two powers agreed to maintain separate squadrons for slave trade prevention, acting in concert when feasible; in 1862, the reciprocal right of search was at last conceded to ships specially authorized. To stamp out the slave trade on land and on sea, as relates to Africa, many states, the United States amongst them, united in the act of 1892, but here too a reciprocal right of search existed only when otherwise granted by treaty.

Fisheries and Sealing.— Here we touch the question of a state's jurisdiction over the high seas and its coast sea. The treatment of the Northern fisheries was a problem in the peace of 1783: it is a problem to-day. In 1783, the high sea fishery was admitted to be open to the new state, while an extensive grant of coast fishing privileges off Newfoundland, Labrador, Nova Scotia, and the Magdalen Islands, was added. As a grant, this privilege was terminated by the War of 1812, according to British contention. By consenting in 1818 to the revival of but a portion of the coast fishery formerly enjoyed, the United States accepted this theory. The grant of 1818 was in terms perpetual. Between this treaty and the next, in 1854, much had happened in fishery matters to disturb the peace of the two countries; adverse provincial legislation, the broadening of forbidden waters by the headland theory; exclusion from the large bays under penalty of capture; and on the other side, smuggling and aggression by our own smacks. In 1854 came in the principle of reciprocity, which really meant free fishing to us, free entry of fish to the Canadians, which they strongly desired. (See RECIPROCITY.) In 1871, this reciprocity, which had terminated, was revived for a term of years, coupled with an arbitration plan for striking a balance of values. Under this the Halifax Commission, 1877, decided $5,500,000 to be due Great Britain. Now we are back on the 1818 basis again, but we still need the Gulf fishing and the Canadians need our market. But as these are, the one of fluctuating the other of great and certain value, it seems false reciprocity to try any longer to balance them. In the Prihilof seal herd, acquired by the Alaska purchase, the United States had a valuable asset. These seals spend part of their year at sea, but returning to their isles to breed are exposed to pelagic attack. The United States has tried to prevent this wasteful method of gathering skins by claiming exclusive jurisdiction over the Eastern Bering Sea, and by claiming ownership in the seals while at sea. When these claims were tested by arbitration at Paris in 1893, they both broke down (see BERING SEA CONTROVERSY), but it had been agreed whatever their respective rights might prove to be, that sealing regulations should be enforced by the two powers for the preservation of the seal herd. Such were framed, but have proven ineffective. The best way of treating the question from the first would have been by international union, to include Russia and Japan. Mr. Bayard tried this, but Canada's influence prevented, and later Mr. Blaine tried the other, mistaken, tack. In 1897, our own country, Japan and Russia, agreed to prohibit pelagic sealing, so long as experts deemed essential.

As to Interoceanic Canals.—The diplomacy of the United States has been long and often concerned with the attempt to secure a favorable canal concession across some portion of Central America, and to define such canal's status. It has been seriously handicapped, however, by two things: (1) In constant uncertainty as to what route was physically best, it has had to negotiate, so to speak, in the dark, with several states, any one of which might be the sovereign of the route decided upon. (2) Our policy has alternated between the neutralization of a canal by the commercial powers, as in the case of Suez, 1888, and single-handed control and protection by the United States, the latter predominating. The victory of the latter

policy was made clear by the defeat of the first Hay-Pauncefote treaty in the Senate. The convincing argument for it was the desire for an exclusive war right in the canal, for naval mobilization. This was rendered possible by the abrogation in 1901 of the Clayton-Bulwer treaty (q.v.) of 1850 with Great Britain. The revolution in Panama and its recognition as an independent state in 1903, followed by a canal treaty with the new state, by which the United States guarantees Panama's continued independent existence, are the final steps in this long process of negotiation and definition. See PANAMA CANAL.

The United States and the Declaration of Paris.—Why has the United States, always standing up for neutral rights, never joined in the neutral bill of rights of 1856, called the Declaration of Paris (q.v.)? It was the abolition of privateering which was Mr. Marcy's stumbling block in 1856, because he deemed the retention of this right necessary to supplement our small navy. But, he said, if you will yield the right to capture enemy's innocent private property at sea as well, our accession will be gladly made. Spain and Mexico likewise refused. Yet when Spain and the United States were at war in 1899, neither side employed privateers. It can be shown that the other rules of the Declaration are in the interest of the United States and accepted by it; also that privateering is not of much practical value to-day, particularly to a naval power. The conclusion should be drawn that in this respect our diplomacy has been a mistake, that we should gain much and lose little by accepting the Declaration of Paris in its entirety.

The Diplomacy of the Civil War.—This was mainly concerned with three classes of questions: (1) those relating to the recognition of Southern belligerency; (2) those relating to the blockade; (3) those connected with the equipment and reception of Confederate ships of war in foreign, mostly British, waters. In the first particular Mr. Seward pursued a wrong-headed policy, claiming the rights of a belligerent to blockade and search, for example, which implied a legal war, but denying nevertheless the existence of a war and of a body of neutral powers. This mistake complicated much of the early diplomacy of the war, and made the attitude of the North most difficult. When states find their relations closely affected by a civil war, their commerce hampered by the rules of blockade, contraband and search, a new flag seeking entrance to their ports, a new government *de facto* applying belligerent rights on the sea, they are warranted by international law and by their own commercial interests, in recognizing the new belligerent and declaring their own neutrality. In our Civil War, Spain, The Netherlands, Great Britain, and France did this, and Mr. Seward complained of it. The blockade of southern ports was a gigantic task, slowly made effective, with some irregularities, but in the main conducted on legal lines. Great Britain, the power whose trade was most affected by it, respected it and was even considerate in declining to press remonstrance in view of lapses in the blockade of certain ports, and in cases where the declaration of blockade for a long period was not substantiated in fact. It was in the partiality with which England's neutrality laws were administered at her colonial ports, and particularly in the violation of those laws in home waters, that she erred. Two Confederate cruisers were built, equipped, armed, and in some degree manned by British agencies. They helped to sweep Northern commerce from the seas. Mr. Adams and the watchful consuls resident in England left no stone unturned to stop them. Never was there a more difficult position than that of C. F. Adams, nor one more gallantly filled. Sympathy for the South pervaded the ruling class. The gradual change of sentiment as the war progressed, the consciousness of a dangerous precedent set, the diplomatic pressure applied after the war by a reunited United States, these led Great Britain on to the settlement of the so-called Alabama claims at Washington in 1871. This was a diplomatic triumph, because it laid down a strict standard of neutral behavior, by which England consented that a court of arbitration should judge her conduct, though denying that it had been theretofore applicable. See ALABAMA CLAIMS.

Naturalization Questions.—The allegiance of individuals is transferred by emigration followed by naturalization. But if the laws of two countries prescribing the conditions of these processes are not identical, since the new allegiance involves protection, upon the return of the individual to his country of origin a legal conflict as to his allegiance may occur. So, too, if his emigration has been unpermitted, or has evaded military service. Owing to the copious immigration which has sought the United States, our diplomacy has been largely concerned with just such cases. Our diplomatic remedy was to seek as a favor for the individual, relief from the obligation or service still due which the naturalized German-American, for instance, visiting his mother country, was held liable for. Some such had served in the Civil War, some had emigrated as mere boys. The law was clear, for a state may lay down its own conditions of emigration. Between 1865 and 1870 the situation became acute, and a remedy was eagerly sought. Another class of difficulties arose where our laws naturalized emigrants of states like England, which held the allegiance of their subjects to be indelible. Here both countries had claims to the service of the same person. By the negotiation of treaties with the North German Union, 1868; Belgium, 1868; Hesse, Bavaria, Baden and Würtemberg, 1868–9; Mexico, 1868; Sweden and Norway, 1869; Austria and Great Britain, 1870; Denmark, in 1872, these difficulties were cured. By these treaties, the right of expatriation was allowed, and our five years' residence requirement was recognized. (See NATURALIZATION.) The provisions of these treaties were reciprocal. Two withheld their privileges from youths who ran away when actually drawn for military service. The others made no such distinction. The subsequent working of these treaties has not been altogether without friction. It may be noted that the modern tendency is towards a uniform five years' residence rule for naturalization, as under the new Cuban Constitution. These naturalization treaties were a very considerable diplomatic achievement, due largely to our minister resident at Berlin, George Bancroft.

The Diplomacy of the United States in the Orient.—This has reflected commercial rather

than political demands. Owing to the radical differences in law, in usage, in racial feeling, European intercourse with the East has insisted for its protection upon a fixed treaty tariff upon imports, and upon that exemption from the local law and jurisdiction which we call exterritoriality. This was a limitation upon the sovereignty of Oriental states. On the other hand, only certain ports in China and Japan were opened to foreign trade. These various features appear in our treaties with China, 1844, 1858, and with Japan, 1854, 1857, 1858. Between 1860 and 1880 both countries began to absorb the new civilization, Japan eagerly and China, vaster and not so centralized, without enthusiasm. Here was the parting of the ways. China thereafter allowed religious freedom, submitted to our drastic immigration restrictions, 1880 and 1894, but otherwise dealt with the United States on the old conservative basis. Japan meanwhile abolished feudalism in 1871; set up a representative parliament, 1881, 1890; adopted a code of law framed on an European model, and made rapid progress in the new ways. Her victory over China in 1895 gave her a position which compelled the powers to surrender their special privileges. In this our own country had prior to the war taken the initiative. And in China we have played no sinister part, though open to criticism for allowing our anti-Chinese legislation to anticipate for a time treaty provisions. A considerable influx of Chinese work people, intense local prejudice against them in the West, some deadly riots in which they have suffered, and on the other hand outrages to missionaries and the Boxer attack on the legations in Pekin have proved some mutual ill-will, while in the main the respective governments have been on friendly terms. With Japan as a power of the first rank, and with China soon to be opened to freer trade, our future relations are likely to be closer and more important. See JAPAN; CHINA; SIAM.

Cuba and the Spanish War.—The relations of the United States with Cuba have been impressed with a sense of the latter's geographical importance, jealousy of its control by any other state than Spain, and a desire for undisturbed trade and settled government. To Cuba, Monroe's declaration of policy has applied with peculiar force. The slave interest before 1860, at one time dreaded a free Cuba, at another desired its annexation. Purchase was several times offered, as in 1847, and in 1854 under the foolish threat of the Ostend manifesto (see OSTEND MANIFESTO), but Spain declined. During the Civil War, Spain showed some sympathy for the South, although it was Southern influence that had coveted the island. The liberal revolution of 1868 in Spain was reflected in Cuba, but there cruelly put down. There ensued a disturbed decade when our neutrality was enforced in spite of aroused sympathy, some filibusterings, and an offer of mediation, 1869. Cuban belligerency was not recognized, though Grant came within an ace of such action. In 1878 the rebellion collapsed, in 1894 it broke out again. In the interval had come illusory reforms, better trade under reciprocity with the United States, and steady misgovernment. We were nearly affected by the new insurrection, in damage to trade and the burden of preventing filibustering. Yet what remedy was there? Recognition of Cuban independence was out of the question, since independence as a fact did not exist. Recognition of Cuban belligerency was inconsistent with our usage and would have hurt our trade still more, while releasing Spain from all further responsibility for losses in Cuba. There remained inaction or intervention. The hand of the administration was forced early in 1898 by the destruction of the war ship Maine in Havana harbor, attributed by many to Spanish agencies, though a court of inquiry fixed no responsibility. War resulted. The chief points at issue before the peace commissioners at Paris were, the assumption of the Cuban debt by Spain, and the disposition of the Philippines. After a struggle and the payment of a solatium, Cuba was set free without being saddled with the costs of her ravaging, and the Philippines were ceded to the United States. So strong was the opposition to this last, as an act of domestic policy, that the Senate barely ratified the treaty.

Modern Diplomacy and General Characteristics.—Other topics with which our diplomacy has had to do might be detailed. Extradition, copyrights and trademarks, free navigation of rivers, Samoan affairs, tariff by treaty, and so on; but these are more conveniently discussed elsewhere. American diplomacy to-day still shrinks from an active part in European politics. This was explicitly stated to the Hague Conference in 1899. With this in mind it is a question if the United States can properly be called a world power. But in point of fact, our interests and our diplomacy have been more impressed by those of Europe than we may think. Our share in international legislation relating to the care of the wounded, industrial property, the slave trade, submarine cables, exchange of official documents, are examples, and particularly since the Spanish War has this been true. One detects in our recent diplomacy a more confident tone, a readier initiative, even the air of leadership, coupled with ingenuity of resource and that simplicity and directness of aim which have long been its characteristics. But yet its defects and handicaps must not be lost sight of,— lack of continuity from frequent change in administration and in party, lack of certainty because of the Senate's control of treaties made by the Executive, lack of a trained diplomatic service. In reviewing the diplomacy of the United States as a whole, one is impressed by its blunt straightforwardness (sometimes amounting to crudity or ill manners), by its usual freedom from intrigue, lastly by its rather surprising successes, owing surely to the soundness of its aims. "Observe good faith and justice toward all nations," wrote Washington in his farewell address, "cultivate peace and harmony with all." Could any diplomacy have had a nobler rule laid down for it? See also DIPLOMACY; INTERNATIONAL LAW; TREATIES.

Consult: Hart, 'Foundations of American Foreign Policy' (1901); Wilson, 'History of United States' (1904); Foster, 'A Century of American Diplomacy,' (1900), and 'American Diplomacy in the Orient' (1903); 'Treaties and Conventions of the United States' (1889); Richardson, 'Messages and Papers of the Presidents' (1896).

THEODORE S. WOOLSEY,
Professor of International Law, Yale University.

19. United States – The War With France. The outbreak of war in 1793 between Great Britain and the French Republic placed the United States in a most embarrassing position. President Washington determined to adopt a policy of neutrality, but for two reasons he found it very difficult to do so. In the first place were the treaties concluded with France in 1778. The treaty of alliance guaranteed forever the integrity of the French possessions in America, and the treaty of commerce provided that French privateers and their prizes should have shelter in United States ports, a favor which was denied to the enemies of France. The question of the privateers gave most trouble. If the United States had adhered strictly to the obligations of the treaty they could not have preserved neutrality. Fortunately, at a critical time, the President's position was strengthened by the intemperate conduct of the French minister, Citizen Genet (q.v.). The encroachments of the belligerents upon our trade rights constituted a second obstacle to the maintenance of a neutral policy. The British and French appeared to vie with each other in their zeal for seizing and confiscating American merchantmen and their cargoes. Many of these outrages could not be justified even under their own extravagant interpretation of the principles of international law. The partial compromise of the troubles with Great Britain in 1794 served to increase the hostility of France.

In March 1797, just after the inauguration of President Adams, news was received that the French Directory had refused to accept Charles Cotesworth Pinckney, who had been sent to supersede Monroe as minister. Desiring to bring about a peaceful settlement if possible, Adams sent Elbridge Gerry and John Marshall to join Pinckney in a special mission. Shortly after their arrival in Paris they were approached by some agents of Talleyrand, who informed them that the Directors were much annoyed at certain remarks made by President Adams in a recent speech, but that a *douceur* of 1,200,000 livres would probably mollify their wrath. Negotiations went on for several weeks, but as the commissioners refused to submit to blackmail, nothing was accomplished. On 5 March 1798 the President informed Congress that certain dispatches had been received from France, which he would lay before them as soon as they could be deciphered and translated. A second message dated a fortnight later stated that the peace mission had been a failure and urged Congress to prepare for war. The Federalists were jubilant and the Republicans very much disconcerted. The publication of the dispatches, however, aroused such strong popular feeling against France that the moderate Republicans gave up their opposition. These documents became known as the X. Y. Z. Correspondence (q.v.), because the government used those letters in referring to Talleyrand's representatives. Both houses of Congress agreed by large majorities to support the President's policy. An act was passed establishing the navy department, and Benjamin Stoddert of Maryland was appointed as the first secretary. Previous to this time naval affairs had been in charge of the war department. Money was appropriated to equip the navy, to strengthen the coast defenses, and to buy arms and ammunition. An act of 14 July 1798 levied a tax on houses, land, and slaves, the first national direct tax ever imposed in the United States. Of more doubtful wisdom were the Naturalization, Alien, and Sedition acts, which were directed against French sympathizers.

The President's course was approved with as much enthusiasm by the public as it was by Congress. "Millions for defense, but not one cent for tribute," became the popular cry. Scores of patriotic war songs were written, among them being "Adams and Liberty" and "Hail, Columbia." Monster mass meetings were held throughout the country, militia companies were organized, and liberal contributions were made for the support of the infant navy. The President continued his preparations for war, then, with every assurance that the nation would support him. Washington was called from retirement to assume the duties of lieutenant-general and commander-in-chief of the army. Naturally much was left to his discretion in the choice of subordinates. Hamilton, Knox, and Charles Cotesworth Pinckney were, at his suggestion, commissioned as major-generals. An unfortunate controversy at once arose in regard to the question of seniority. Adams favored Knox, and gave an order that his commission should be made out before the other two. This plan was so strongly disapproved by Washington that the President finally yielded, and Hamilton was made second in command. Four brigadiers were appointed, and steps were taken to increase the army to a war footing. These elaborate preparations for the strengthening of the land forces seem somewhat premature. It was not at all likely that France would attempt an invasion, and, unless Spain should be drawn into the conflict, there was no territory in America which we could attack. As a matter of fact, hostilities were confined to a few minor naval engagements. Early in July 1798 Stephen Decatur, the elder, in command of the sloop of war Delaware seized a French privateer mounting 20 guns. The prize was refitted, named the Retaliation, and placed under the command of Captain Bainbridge. The most serious battle of the war was fought off the island of Saint Kitts in February 1799. After a chase of three hours and a fight of an hour and a quarter, Commodore Truxtun's flagship, the Constellation, forced the French frigate L'Insurgente to lower its colors. La Vengeance, another French frigate, attacked by Truxtun in February 1800, escaped only as the result of an accident. Just as the victory was almost won the foremast of the Constellation fell over the side, drowning a young midshipman and several of the crew, and making it impossible to continue the pursuit of the enemy.

In spite of these successes the President manifested very little zeal for the prosecution of the war. This was doubtless due in part to jealousy of Hamilton, but it was mainly the result of his intense conservatism. John Adams was not the man to sympathize with the hair-brained schemes of Hamilton for the conquest of the Floridas, and he was certainly not the man to continue a war when there was no longer good cause for it, merely because public opinion seemed to favor it. Hearing that the French government would receive a minister from the United States and would treat him with courtesy and respect, he nominated William Vans Murray

to that position. The members of his own party were taken completely by surprise, and the leaders of the war faction made an attempt to defeat Murray's confirmation in the Senate. Adams checkmated their plans by withdrawing Murray's name and substituting three commissioners, Murray, Chief Justice Ellsworth, and Patrick Henry (25 Feb. 1799). Henry refused to accept, and William Davie of North Carolina was selected in his stead. Much to the chagrin of Hamilton, the Senate confirmed the nominations. The Hamilton partisans in the Cabinet now made a final attempt to delay the departure of the commissioners, but their success was of short duration. The President asserted his authority, and the commissioners set sail in October 1799. The Federalists throughout the country were at first surprised, not to say disgusted, at the peace policy of the chief executive. Hamilton's intrigues to checkmate his plans, moreover, resulted in a revulsion of feeling, and it may safely be said that the commissioners sailed with the approval of the vast majority of the American people.

The mission was successful. A treaty of peace was concluded with the First Consul, 30 Sept. 1800. Provision was made for the restoration of captured ships and goods which had not yet been condemned. For protection in the future the rule was adopted that "free ships make free goods," except in the case of contraband of war. The terms blockade and contraband were defined, and certain regulations were made in regard to prizes and privateers. The most serious problem arose from the desire of the United States to be released from the obligations of the treaties of 1778 and the desire of France to avoid paying indemnities for the American vessels and cargoes which had been confiscated. Article two of the new convention provided for the postponement of both questions until a future settlement, with the understanding that in the meantime the treaties of 1778 should not be in force. Strong opposition was made in the Senate to this article on the ground that it sacrificed the claims of American merchants. It was finally struck out and a clause was inserted limiting the convention to eight years. In this amended form the treaty was returned to France. Napoleon ratified it with the proviso that each country made the concession which the other demanded. The Senate passed the final vote of ratification with this understanding. It was this bargain which gave rise to some of the French spoliation claims. The obligations of France were, of course, not to the United States government, but to American citizens who were engaged in foreign trade. Consequently when our government released France from those obligations, it tacitly assumed them itself. This treaty of 1800, like the Jay Treaty with England, was really only a temporary settlement. The troubles with both countries continued until the close of the great European conflict on the battlefield of Waterloo. See TREATIES; UNITED STATES — DIPLOMACY OF THE.

Consult: Schouler, 'History of the United States'; MacMaster, 'History of the United States'; Morse, 'Life of John Adams'; Lodge, 'Life of Hamilton'; Adams, 'Works'; Annals of Congress, VII.–X.; American State Papers, Foreign Relations; Treaties and Conventions of the United States (1776–1887); Richardson, 'Messages and Papers of the Presidents.'

W. ROY SMITH,
Associate in History, Bryn Mawr College.

20. United States — The Louisiana Purchase. The vast province of Louisiana was ceded by France to the United States 30 April, 1803, the purchase price being $15,000,000. Originally belonging to France, Louisiana was ceded to Spain by the treaty of Paris in 1763, and was retro-ceded to France for the purpose of colonization 1 Oct., 1800, with the understanding that if it was ever again ceded away, it should revert to Spain. It was shortly after President Jefferson's installation that information concerning the retrocession of Louisiana to France reached America. Though the act was believed to be hostile to the interests of the United States, yet Jefferson hoped to maintain the friendly relations with the French government so recently restored by the so-called treaty of Morfontaine. But when the Spanish intendant, Don Juan Ventura Morales, closed the port of New Orleans to American trade, Jefferson began to see the purpose of the first Consul in securing the retrocession of Louisiana and to experience a foretaste of Bonaparte's aggressive policy. Morales' act in closing the right of *entrepôt* at New Orleans, as the right of deposit was called, was regarded throughout the United States with feelings of strong disapproval. Excitement ran high, especially in Tennessee and in Kentucky, in which states the people were eager for war. The Western settlers looked upon the summary closing of the port as the initial step in Bonaparte's aggressive policy, which contemplated not only the arrest of American trade development, but also of any farther expansion toward the Mississippi. The Western traders had chafed greatly under Spanish authority along the banks of the Mississippi. Spain blocked the way to farther expansion on the west and held control of all the waterways leading to the Gulf of Mexico, since the entire seaboard along that gulf was under Spanish dominion. Moreover, the whole valley of the Ohio as far as Pittsburg was dependent upon the permission of the king of Spain for an outlet to the Gulf for its rapidly increasing trade with the outside world. This permission the king granted, and by the treaty of 1795, which Godoy executed by way of offsetting Jay's treaty, Spain gave the United States special privileges along the Mississippi, as the right of deposit at New Orleans with only a nominal charge. Still the Western traders were subjected to much annoyance under Spanish rule, and a growing desire manifested itself to expel Spain from that region and to annex her rich territory to the United States.

After Charles IV. ceded Louisiana to France and Spain retired from the Mississippi, conditions were not improved, but rather aggravated, since the Western States feared Napoleon's grasping ambition quite as much as they had despised King Charles' authority. When, therefore, the port of New Orleans was summarily closed, preparatory to the transfer of that region to France, there was such an outburst of popular feeling throughout the United States that President Jefferson was constrained, despite his strong desire for peace, to open negotiations

United States of America, 1900.

immediately for the purchase of West Florida and New Orleans, as affording an outlet to the sea. Accordingly, he instructed his ambassadors at Madrid and Paris, if possible, to obtain from their respective governments the cession of West Florida and New Orleans. Congress was fully alive to the demands of the people, and on 12 Jan. 1803 appropriated $2,000,000 with a view to purchasing the desired territory. Jefferson appointed James Monroe as minister extraordinary to France to aid Chancellor Livingston, United States ambassador at Paris, to effect the purchase of New Orleans and West Florida. When Monroe set sail for France, on 8 March, 1803, Jefferson was not at all confident that Monroe's mission would be successful. He admitted that he sent him largely to conciliate the people and to restore political quiet throughout the country, then much worked up over the situation.

In treating for the purchase of West Florida and New Orleans Monroe's instructions included three contingencies: Monroe and Livingston were to buy the desired territory if it could be bought for any sum not exceeding $10,000,000. They were to offer, besides the purchase price, commercial privileges for 10 years in the ceded ports, the incorporation of the inhabitants on an equal footing with the citizens of the United States, and, if demanded, even a guaranty of the west bank of the Mississippi. As a second contingency, in case France refused to sell the territory in question, the ambassadors were instructed to sue for the right of deposit, together with such privileges as France would grant. In the event France acceded to neither of these propositions, then the ambassadors were to be given special instructions by Congress adapted to the case. This last contingency might mean war, or it might mean further procrastination. In a communication to the first Consul, delivered through Pichon, Jefferson had already hinted at a probable alliance with England in case France declined to accept any terms whatsoever and positively refused relief to the United States from the severe conditions of trade along the Mississippi. When Livingston and Monroe first opened negotiations through Talleyrand for the purchase of New Orleans and West Florida, the French minister of foreign affairs held out but little hope. The American ambassadors used every argument, but to no purpose, apparently. However, the aspect of affairs soon changed. The first Consul was growing weary of the drain on his resources which Santo Domingo entailed. He reflected, too, that he would soon need all the men and money he could command for the execution of his plans in Europe. When, therefore, he received intelligence of the death of Leclerc in Santo Domingo and the annihilation of his army and the general uprising of the negroes of that province, he realized that the offer of the United States furnished him a suitable occasion for abandoning his costly schemes of French colonization in America, under cover of a new enterprise, and he gladly closed with the American ambassadors to cede to the United States the whole of Louisiana for the largest sum he could obtain. He needed money to replenish his exchequer for his contemplated war with England and Germany, and he did not hesitate to break his word with Spain in ceding away Louisiana, which act, perhaps, he intended as a punishment for Spain for Godoy's treaty with the United States. The American ambassadors, astonished at the offer to sell the whole or no part of Louisiana, though not authorized to purchase the entire province, wisely closed with Talleyrand and Marbois and agreed to buy the whole of Louisiana. After some haggling over the price, Livingston and Monroe agreed to pay France $16,000,000. The documents were signed early in May and antedated to 30 April 1803, and thus the United States, beyond the expectation of all, acquired possession of the vast province of Louisiana.

The treaty for the cession of Louisiana is notable in that it contains no definition of the boundaries of the property transferred. When the American commissioners insisted that the boundaries of Louisiana be defined, they were merely informed that the boundaries were the same as they were in the hands of France, according to Berthier's original treaty of retrocession. However, it was definitely understood on both sides that the Floridas were not included in the transfer, since that territory did not belong to France. Article III. of the treaty provided that "the inhabitants of the ceded territory shall be incorporated in the Union of the United States, and admitted as soon as possible, according to the principles of the Federal Constitution, to the enjoyment of all the rights, advantages and immunities of citizens of the United States." In addition to the sum of $11,250,000, which the United States promised to pay France, the United States agreed to assume the spoliation claims of American citizens against the French government, amounting to $3,750,000, thus making the price in all $15,000,000. The ratification of the treaty by the Senate of the United States gave rise to a perplexing constitutional question as to the right of Louisiana to be admitted into the Union and the process to be adopted. President Jefferson recommended, since there was no authority in the Constitution to buy foreign territory, that a constitutional amendment be adopted as the most convenient solution of the problem. However, the treaty was at length ratified without recourse to a constitutional amendment, and the President acquiesced even at the risk of making blank paper by construction of the Constitution. Spain protested vigorously against the cession of Louisiana to the United States, alleging that the first Consul had violated the treaty of retrocession and claiming that the province could be ceded to herself only. But when the Spanish government realized that both the United States and France were resolved to make good the transfer, even by a resort to arms, if need be, Charles IV. yielded and accepted the cession as inevitable. Thus, for $15,000,000, the United States added to her territory a vast region extending from the Mississippi to the Rocky Mountains, and from Mexico to the Lake of the Woods. The annexation of Louisiana not only increased the territory of the United States by an immense area, but it also put a new complexion upon the politics of the nation and marked a new epoch in the national life.

In 1901 the total population of the 14 States and territories occupying the area originally in the Louisiana Purchase was 14,706,563. Their industries are shown in the following tables:

VALUE OF FARM PROPERTY.

Arkansas	$181,416,001
Colorado	161,045,101
Indian Territory	92,181,615
Iowa	1,834,345,546
Kansas	864,100,286
Louisiana	198,536,906
Minnesota	788,684,642
Missouri	1,033,121,897
Montana	117,859,823
Nebraska	747,950,057
North Dakota	255,266,751
Oklahoma	185,343,818
South Dakota	297,525,302
Wyoming	67,477,407
Total	$6,724,855,132

or a permanent value in farm property alone of over 448 times what we paid for the entire property.

MANUFACTURES.

	Capitalization
Arkansas	$35,960,640
Colorado	62,825,472
Indian Territory	2,624,265
Iowa	102,733,103
Kansas	66,827,362
Louisiana	113,084,294
Minnesota	165,832,246
Missouri	249,888,581
Montana	40,945,846
Nebraska	71,982,127
North Dakota	5,396,490
Oklahoma	3,352,064
South Dakota	7,578,895
Wyoming	2,411,435
Total	$931,442,820

or a permanent value in manufactures alone of over 62 times what we paid for the entire property.

YEARLY PRODUCTS.

	Agriculture	Manufactures
Arkansas	$79,649,490	$45,197,731
Colorado	33,048,576	102,830,137
Indian Territory	27,672,062	3,892,181
Iowa	365,411,528	164,617,877
Kansas	209,895,542	172,129,398
Louisiana	72,667,302	121,181,683
Minnesota	161,217,304	262,665,881
Missouri	219,296,970	385,492,784
Montana	28,616,957	57,075,824
Nebraska	162,696,386	143,990,102
North Dakota	64,252,494	9,183,114
Oklahoma	45,447,744	7,083,938
South Dakota	66,082,419	12,231,239
Wyoming	11,907,415	4,301,240
Totals	$1,555,862,189	$1,491,873,329
	1,491,873,329	
Grand total	$3,047,735,518	

or a revenue each year of 203 times what the United States paid for the entire property. See also LOUISIANA PURCHASE.

EDWIN W. BOWEN,
Department of Latin, Randolph-Macon College.

21. United States — Causes of the War of 1812. The latter years of the 18th and the earlier years of the 19th centuries witnessed a phenomenal growth of American commerce due to incessant wars in Europe. Naturalization was easy in the United States and the wages of seamen were high. Great numbers of English sailors availed themselves of these advantages. England became jealous of American trade. She had never granted to her subjects the right of expatriation, though she gladly recruited seamen wherever they could be found. In 1793 the right of searching neutral, especially American, vessels was claimed and put into practice. This so-called right meant that wherever an English warship met American merchantmen or war vessels they were required to stop, order their men on deck and permit as many sailors to be seized and forced into the English service as were unable to prove their nationality. It was maintained that only deserters from the English navy were wanted; but in the period of 1796 to 1802, 1,042 American seamen were pressed into the English naval service on the plea that they were deserters.

When the war between Great Britain and Napoleon broke out afresh in 1803, American trade received another impetus. French, Spanish, and even English traders raised the American flag in order to get the advantages of neutrals. An arrangement between England and the United States permitted American vessels to take in cargoes in her colonies provided these commodities were consigned to United States ports. The cargoes were afterward reshipped to Europe. This arrangement gave rise to great abuse. Ship-owners learned to touch at American ports, unload their cargoes, pay the required tax in the form of a bond, reload and, at the same time receiving their bonds back again, set sail for foreign markets. Thus it appeared that England's commerce would fall into the hands of her rivals. To break up this almost illicit trade and at the same time to bring the impressment policy more strictly to bear upon the Americans, British war vessels were stationed just outside the more important ports of the United States. In the rigor of this surveillance American citizens were seized and American vessels confiscated in larger numbers than ever before. English cruisers virtually blockaded the Atlantic coast from Maine to Georgia. On 27 June the British war vessel, Leopard, under orders from the British admiral at Halifax, signaled the Chesapeake to stop as she was leaving Norfolk harbor. An officer was sent aboard the Chesapeake to search for deserters. Commodore Barron of the Chesapeake refused to muster his men. Thereupon the Leopard opened fire and, taking the Chesapeake by surprise, speedily disabled her; three men were killed and eighteen wounded. When the search was completed only one Englishman was found. Nevertheless three American sailors were taken away, one being a negro. The «Chesapeake affair» excited the people of the United States almost beyond precedent. Indignation meetings were held in most of the towns. Prominent men presided over these gatherings; thousands of petitions calling loudly for reparation were sent to the President. War soon became the cry. President Jefferson did not believe in war, but he felt keenly the force of the insult and, after forbidding American harbors to English war vessels, he sent an agent to England to demand disavowal of and reparation for the attack on the Chesapeake. England paid no attention to the President's representations.

While English-American relations were thus assuming a threatening attitude neutral trade was suffering still further restrictions in Europe. In May 1806, provoked by Napoleon's closing the ports of Hamburg and Bremen, England declared, through her Orders in Council, the coasts of Belgium, Holland and Germany to the mouth of the Elbe in a state of blockade. On 21 Nov. 1806 the French emperor replied by the Berlin decree which declared a similar blockade of all the ports of England. Neither the orders

nor the decrees could be enforced, but they made trade with England, France, and Germany unlawful. Yet during the year 1807 still other Orders in Council were issued. These closed to neutral commerce all the ports of European states friendly to France, and authorized the seizure of any neutral vessel *en route* to any closed port unless its captain first entered an English harbor, subjected its cargo to taxation and obtained a license to trade. Napoleon's reply was the Milan decree, which ordered the confiscation of every neutral vessel that permitted itself to be searched or in any wise recognized the British Orders in Council.

The British orders and the French decrees, the so-called right of search and finally the actual attacking of American war vessels seemed to leave the United States government no peaceful way out of her situation. President Jefferson, however, suggested in 1807 that an embargo be laid on all American shipping. Congress had already prepared the way for such a policy at its previous session in the non-importation law which had not been put into force until a few weeks before. Congress assembled in November 1807, and immediately fell in with the President's idea of starving Europe into a recognition of the rights of neutral trade. The embargo went into effect in December 1807, and remained in force until 4 March 1809. This law solved none of the difficulties it was intended to solve. Opposition to the measure became so great that an Enforcement Act was passed. This gave the President despotic powers; yet the commercial sections of the country resisted the law and smuggling became so general in New England that local officers of the United States declined to make any effort to stop it. The South suffered much hardship, too: tobacco and wheat, the principal commodities of export, shrank to one half their former value. The Union itself seemed about to go to pieces just before the close of Jefferson's administration.

In place of the embargo a second Non-intercourse Act was substituted, which, though it practically prohibited trade with the great warring powers of Europe, gave some promise of improving the condition of commerce. With this change of policy Madison became President, 4 March 1809. England now sent a new minister, David Erskine, who speedily negotiated a treaty which promised the withdrawal of the Orders in Council. Madison suspended the Non-intercourse against Great Britain on 10 June 1809 by proclamation. The merchants and ship owners who had respected the Non-importation hastened their goods and ships to sea. On 10 June 600 vessels sailed from American ports to take chances with their enemies in Europe. In July the news that Erskine's treaty had been disavowed by the London cabinet and that Erskine himself had been recalled came as a painful surprise to the American people. Madison issued at once a second proclamation which recalled the first and replaced the former restrictions on English trade. The British cabinet now sent F. J. Jackson as minister to the United States. Jackson completed the alienation of the American government. He insulted the President and ruined his own cause by insisting that Madison had duped Erskine into signing the recent treaty. The new minister was summarily dismissed. Rose, another British representative, appeared next year in Washington, but his efforts availed nothing so long as his government forbade him to yield the great point in question — the repeal of the Orders in Council.

The year 1809 proved the Non-intercourse ineffective, more injurious to Americans than to England and France, for now both powers had a chance to enrich themselves by enforcing the laws of the United States against her own commerce. Napoleon proposed in his Rambouillet decree (March 1810) to sieze every vessel within his reach, that is, in the French harbors, on the ground that such vessels had, perhaps, recognized England's Orders in Council and were thus subject to his Milan decree; or if not, then they had violated the laws of their own country in offering to trade at all with either France or England. In a few months $10,000,000 worth of property was thus seized and finally confiscated. Before Napoleon issued his Rambouillet decree the American Congress had resolved to repeal the Non-importation Act. In place of it a new law was passed which held out a sort of bribe to England and France: in case either nation should cease to violate the commerce of the United States then non-importation should be revived against the other and maintained until neutral trade ceased to be violated. Napoleon again turned an American law to his own advantage: he announced that his decrees would be suspended as against the United States after 1 Nov. 1810, if by that time England had suspended her orders or if the United States "caused her flag to be respected." However, he continued to sequester American cargoes. President Madison considered this a sufficient concession. He gave England warning that non-intercourse would be enforced against her if the Orders were not rescinded by 2 Feb. 1811. When the time expired, no action having been taken by England, Congress renewed the former law and prohibited all importation of English goods. This caused some alarm in England, but there was no abatement of impressments. A new minister was sent to Washington. His instructions, however, still permitted no promises of any change in British policy.

While the ire of America was constantly rising there came the news in May 1811, only three months before most of the congressional elections were to take place, that the United States frigate, President, had encountered the British sloop, Little Belt, after a hot chase of several hours, and practically annihilated her. Never was news more welcome to American ears. The "Chesapeake affair" had been avenged. Minister Foster wrote his government that the Americans no longer pressed for reparation on that score. Public meetings were again held and the newspapers, especially in the South, were filled with exaggerated accounts of what had happened. Other events occurred during the summer and autumn of 1811 which tended to hasten the breach with England. The Indians on the western frontier from Fort Dearborn to northern Georgia formed a confederation against the United States. Tecumseh, the famous Shawnee chief, was the soul of the movement. It came to a battle at Tippecanoe, in western Indiana, on 7 Nov. 1811. The Americans, under General William Henry Harrison, gained a complete victory. Tecumseh joined the English soon

after and the general belief that England instigated the Indian attacks was confirmed. Harrison's victory was the second good omen of the year.

Notwithstanding all these causes for war it is quite probable that the government would not have declared hostilities the next year but for the revolution which took place in the Republican party — the controlling party since 1801. This party had come into power as an uncompromising opponent of English influence in the country. It had, however, for its leader and founder a man who opposed war from principle — Jefferson. The old Republicans, co-workers with Jefferson, had become so opposed to war that they permitted themselves to be isolated. The events of 1811 taught the people a bolder policy. The antipathy for England which pervaded the ranks of the party had outgrown peaceful embargoes and non-importation laws; men thought again of the Revolution. They elected new representatives to Congress. The new Congress had a membership of one hundred and forty; on its assembling more than seventy were found to be young and untried politicians. The most important of these new men were Henry Clay of Kentucky and John C. Calhoun of South Carolina. When Congress met the younger element evinced a war-like feeling quite unusual in that body. Clay was at once elected speaker of the House, and with the aid of his friends he organized that branch of the legislature for the purpose of war. These young leaders were vigorous nationalists; they thought of the Union as a great state; they looked to the future and had confidence in the Republic; they were imperialists who not only hoped to compel Europe to respect their flag but who aimed to conquer and annex Canada. They counted on using their strength to the utmost advantage against England because of the impending struggle with Napoleon. In this President Madison joined them. From November 1811 to the end of the session the new party exercised all its ability and ingenuity in persuading Congress and the country to prepare for hostilities. After long and weary debates and after many a compromise on army and naval matters, war was at last declared 18 June. The invasion of Canada had already begun. See TREATIES; INTERNATIONAL LAW; UNITED STATES — DIPLOMACY OF THE.

Consult: Adams, 'History of the Administrations of Jefferson and Madison'; Schouler, MacMaster, 'History of the United States'; Hunt, 'Life of James Madison.'

WILLIAM E. DODD,
Professor of History, Randolph-Macon College.

22. United States — The War of 1812. The War of 1812 began officially on 18 June. The army of the United States numbered at that time 6,744 regulars. It was poorly equipped, poorly drilled and its morale was extremely low. But Congress had authorized its increase to 25,000 and provided, at least by law, for a second volunteer army of 50,000 men; besides, the militia of the several States was called on to co-operate with the regulars and the volunteers. The result of these acts was very unsatisfactory. The regular army never during the war reached 10,000, the volunteers appeared only in small numbers and the militia offered to serve only for short terms and then preferably in their own States. The governments of the New England States prohibited their militia from going beyond their State boundaries and various obstacles were put in the way of enlisting. The South was too remote from the theatre of action to feel the need of sending the militia to the front. Tennessee, Kentucky and the old Northwest furnished the main body of soldiers, regular and irregular, who fought in this war. The American navy apparently promised still less at the beginning of the conflict. It consisted of seven frigates and nine smaller craft. And as to the sinews of war, the treasury was in a precarious condition as a result of the numerous trade regulation acts of Jefferson's and Madison's administrations. Congress was inveterately opposed to laying new taxes in any form. Loans had to be resorted to at the beginning. But the bulk of the capital in the country was in New England and New England was bitterly opposed to the war. Hardly half the money asked for was subscribed. On the other hand, England was contending in Europe with her great enemy, Napoleon. The British troops in Canada numbered barely 7,000; their line of defense was 1,000 miles long. The English navy was, however, the undisputed mistress of all the seas; the North Atlantic squadron counted three battle ships, 20 cruisers and 50 smaller ships.

The conquest of Canada was made the first object of attainment. An army of 1,850 men, under command of General William Hull, crossed the Detroit River in the latter part of July 1812. Hull threatened the British stronghold, Malden, for a few days; but hearing that the English and their Indian allies had seized Mackinaw, a fort at the head of Lake Huron, he retreated across the American border to Detroit. From this point Hull hastened off two regiments to oppose the advance of the enemy from the west. At this juncture the British Major-General Brock crossed the river and demanded the surrender of the Americans. Hull's supplies were already becoming scarce, his basis of operations was 200 miles south, and his communications were most difficult to maintain. He surrendered the fort and all the troops under his command, without a fight, on 14 Aug. 1812. Some 2,500 men, 33 guns and the whole of Michigan were thus lost at the beginning of the contest. The principal cause of this was the failure of General Dearborn to march into Canada from the eastern end of Lake Erie, according to the plan of the campaign, and thus cut off all supplies from Brock and finally force him to surrender. But while Hull made his way through dense forests to Detroit, Dearborn was in Boston attending to the political side of the war. Not until October, nearly two months after the disaster at Detroit, did Dearborn cross the Niagara; and then it was with only a small part of his army under the command of Van Renssellaer, a New York militia commander. Van Rensselaer attacked Queenstown (13 Oct. 1812), and was repulsed by General Brock, who had hastened from the scenes of his recent triumph to check this second movement. He was successful, though he was killed in the engagement. The campaign closed with the enemy in possession of the western forts and the territory of Michigan to the Maumee River. In the east the border remained the same.

But while things had thus gone ill on land, the navy had in a measure restored American

confidence. The frigate Constitution, Captain Isaac Hull in charge, met the British Guerrière about 800 miles northeast of Boston on 19 Aug. 1812 and captured her after a fight of 30 minutes. Hull reduced his enemy's ship to a complete wreck, killed or wounded one third of their crew and received the remainder as prisoners of war. On 18 October, the American sloop, Wasp, met the British sloop, Frolic, and completely demolished her and on the 25th the United States, a frigate of 44 guns, fought the British frigate, Macedonia, 38 guns, and gained as signal a victory as that of Hull over the Guerrière. This telling work of the navy took the world by surprise. England forbade her seacaptains to fight American ships of superior tonnage. American privateers swarmed the Atlantic. They did effective work. It became dangerous for an English merchantman to cross the English channel. They captured 500 vessels during the fall and winter of 1812–13. Marine insurance for the Irish Sea rose to 13 per cent.

The campaign of 1813 centred about Lake Erie. General William Henry Harrison had led an army of militia, volunteers and regulars from Kentucky during the preceding summer with the object of reconquering Detroit. The winter and spring of 1812–13 were practically wasted; but news reached him, while still in upper Ohio, 12 Sept. 1813, that Commodore Perry had annihilated the enemy's ships on Lake Erie, and he began to move forward more rapidly. Perry had devoted the spring and summer to the construction of a fleet which he thought would break the power of the British on the lake. On 10 September, Perry came up with the enemy's vessels under command of Captain Barclay. After a serious mishap to his flagship Perry took command of the Niagara, came within close range and after two and a half hours of heroic fighting, completely defeated him. Thenceforth the lake remained in American hands. Harrison was now on the offensive. With the aid of R. M. Johnson's regiment of cavalry he forced Proctor, the English commander, across the Detroit. Proctor remained a few days at Malden, but, very much to the chagrin of his Indian allies, he continued his retreat northward. On 5 October, on the north side of the river Thames, he gave battle to his pursuers. Proctor lost his entire army; the Americans lost 15 killed and 30 wounded. Upper Canada fell into American control. At the eastern end of the lake and looking to the gaining of Lake Huron, General Dearborn made several half-hearted moves. On 27 April 1813, the town of York (now Toronto) was attacked. A sharp battle ensued. The Americans were successful and in the disorder which followed the victory the government house was burned. A month later Commodore Chauncey compelled the English to evacuate Fort George on the Niagara, while the English made an unsuccessful attempt on Sackett's Harbor. An expedition to Montreal under the command of General Wilkinson proved a signal failure. The year closed with Lake Ontario still in English hands. At sea the Americans were unable to hold their own. On 1 June the frigate Chesapeake, commanded by Captain Lawrence was defeated and destroyed by the British frigate, Shannon. The enemy now blockaded the whole Atlantic seaboard.

The year 1814 brought Napoleon's overthrow and consequently peace in Europe. Veteran troops were sent to Canada and to the South. But the Americans were becoming inured to war; there was a more general support of the administration. After some feeble movements in the spring a third invasion of Canada was begun. The Americans numbered 4,700; the enemy was equally strong. At Chippewa an attempt was made to check the invasion but without success. On 25 July Lundy's Lane, the bloodiest battle of the war, was waged. The British were 3,000 strong; the Americans, 2,600. The greatest valor was manifested on both sides; the losses amounted to about one third of the forces engaged. Both sides claimed the victory; but the invaders held their ground until autumn when they withdrew to the Niagara. In September an invasion of New York was attempted from the Canadian side. The line of Lake Champlain and the Hudson River was selected; but Commodore McDonough foiled the plan in the famous battle of Plattsburg on Lake Champlain on 11 Sept. 1814. The campaign closed with no serious advantage gained on either side. To divert attention from Canada the British cabinet had sent an army of 3,500 men under General Ross to threaten Washington. Finding the capital so poorly defended, Ross landed his force, marched directly on the city, and, though meeting with some feeble resistance at Bladensburg, drove the government into the woods and set fire to the public buildings — in retaliation for the destruction of the public building at York a year before. Ross now turned his attention to the city of Baltimore. Here he met with some resistance, the general himself being killed in the attack.

New Orleans was the next object. There was chance here of Indian support from northwestern Georgia. An army of 6,000 British regulars sailed for the Mississippi under command of General Packenham. It appeared a few miles southwest of New Orleans (q.v.) on 23 Dec. 1814. The Americans were commanded by General Andrew Jackson. Before the decisive engagement occurred both armies had been augmented to about 8,000 men each. Jackson fortified himself a few miles below the city and awaited the approach of Packenham; on 8 January at early dawn the battle began. Seeing his men waver, Packenham undertook to rally them. He was instantly killed; repeated efforts were made to carry the American works, but without avail. The English withdrew, having lost 2,036 men killed or wounded. Jackson's loss was 71.

On 24 Dec. 1814 the treaty of peace had been signed in Ghent. No mention was made in the treaty of impressment of sailors, of the right of search, or of the status of neutral trade. The fall of Napoleon had made these questions obsolete. As to boundaries neither party gained anything. The cost of the war had been $100,000,000, 1,400 ships of all kinds, 21,000 sailors, and about 30,000 soldiers killed or injured. Its benefits were the rise of a truly national spirit, the weakening of the State supremacy of former days and the consequent overthrow of the half-treasonable opposition of New England. Consult: Adams, 'History of the Administrations of Jefferson and Madison'; Schouler; McMaster; Hunt, 'Life of Madison.'

William E. Dodd,
Professor of History, Randolph-Macon College.

23. United States — Finances of the (1789–1816). The finances of the government of the United States in 1789 were in a most unfavorable condition. Not only had the Revolutionary War left a legacy of national indebtedness, amounting in 1784 to $39,000,000 exclusive of the continental bills of credit, but owing to the defective revenue system prescribed by the Articles of Confederation, no adequate provision could be made either to pay the principal or to meet the annual interest charges. When the new Federal government under the Constitution was established, the debt had swelled to $54,000,000; of this $11,700,000 was owed abroad. In addition to the above obligations, there was an unknown amount of State indebtedness, approximating $20,000,000. The total debt was a heavy burden for a population of less than 4,000,000, and for a country as yet undeveloped in its material resources.

In 1790 Congress enacted an elaborate funding scheme providing for three loans. The first of $12,000,000 to take up the foreign indebtedness; a second, to the full amount of the domestic debt, accepting at face value all obligations previously authorized, excepting bills of credit which were rated at 100 to 1; and a third of $21,500,000, to cover such State indebtedness as had been incurred for war purposes. The act was a complicated measure with ingenious contrivances, not only to make the loans acceptable to holders of old obligations, but also, by varying rates of interest and deferred interest on a portion of the debt, to afford the new government time to recover from its financial misfortunes. On two points there was bitter opposition to the passage of the act: (1) from those who objected to the acceptance of old certificates of indebtedness at their face value, inasmuch as these had passed current at depreciated value, and had fallen into the hands of speculators; (2) from the Southern States which had paid off a larger share of their indebtedness, and consequently were unwilling to be burdened with the debts of States which had been less self-sacrificing. The first objection was met by the firm contention that national credit could not tolerate discrimination; the second was removed by a shrewd bargain which established the new capital in southern territory on the boundaries of Maryland and Virginia. In 1795 after the funding operations were over, the total debt amounted to $80,700,000, bearing an annual interest charge of about $3,000,000.

The revenue system established in 1789 was of simple character. A tariff act with low rates was passed; specific duties were placed on about 30 articles; ad valorem rates of from 7½ to 15 per cent on a few specified commodities, and a 5 per cent ad valorem rate on unenumerated articles. Tonnage duties were included, and the principle of discrimination against goods imported in foreign vessels and foreign shipping was adopted. Although the rates imposed in this tariff were low, the debate on the measure, as well as the preamble of the act, shows that the principle of protection of home industry was recognized.

In the law establishing a treasury department, provision was made for a secretary of the treasury, a cabinet position; for a comptroller to pass on the legality of bills presented against the government; for an auditor responsible for the accuracy of the accounts; for a register to preserve the accounts; and for a treasurer to receive and pay out money on presentation of proper warrants. The framework of this system has continued until the present time and has proved highly effective in safeguarding the government against illegal expenditures. Alexander Hamilton (q.v.) was chosen secretary of the treasury, and by his constructive genius, exhibited in a remarkable series of reports on public credit, a mint, national bank, and manufactures, encouraged Congress to establish its credit on a broad and generous basis. Through his influence the Bank of the United States was established which granted temporary loans to the government, furnished a sound note circulation, and took care of the government funds. In 1791 it was found that additional revenue was needed, and under the advice of Hamilton internal revenue duties were imposed upon the distillation of spirits. This provoked opposition, especially in the agricultural section of the Middle and Southern States. Here it was claimed that the interior was sacrificed to the commercial interests of the Northern seaboard. In 1794 there was open defiance in Pennsylvania, and the federal troops were called out to put down the so-called Whiskey Insurrection (q.v.). It was contended that the collection of the taxes was inconsistent with the principle of individual liberty, that it injured morals by inducing false swearing, was burdensome, and interfered unduly with the business of distilling. Although the opposition failed in its efforts, the tax was not fruitful, amounting in 1793 to only $422,000 from which about one quarter was deducted for cost of collection and returns for drawbacks. In 1794 excise duties were extended to carriages, sales of liquors, manufacture of snuff, refining of sugar and auction sales. The constitutionality of the carriage tax was assailed on the ground that it was a direct tax and should be levied by apportionment according to population. The Supreme Court, however, in the case of U. S. *v.* Hylton (1796) decided that under the Constitution there were practically but two direct taxes, the poll tax and the tax on land, that the carriage tax was an indirect tax and consequently constitutional. Expenditures continued to exceed the earlier estimates; the Indian war of 1790 was followed by the Whiskey Insurrection, and in 1797 new military and naval expenditures were demanded on account of the strained relations with France. In 1798 a direct tax of $2,000,000 was laid upon dwelling houses, lands and slaves. In 1800 the total receipts from all sources was about $10,848,000, of which $9,081,000 was derived from customs and $1,543,000 from internal revenue and the direct tax.

Hamilton resigned from office in 1794 and was succeeded by Oliver Wolcott who maintained the Federalist policy of his predecessor. The administration of each was subjected to severe and bitter criticism by the Republican party under the leadership of Albert Gallatin. Charges were made that the accounts were juggled, that adequate information of the condition of the treasury was not given to Congress, and that appropriations were not made for specific objects but in lump sums, giving undue and arbitrary power to the treasury department. In 1801 the Republicans came into power with Albert Gallatin as secretary of the treasury.

Economy and abolition of what were regarded as inquisitorial taxes were immediately entered upon. Appropriations for the army, navy and diplomatic service were reduced and the excise duties were repealed. The latter step, however, was taken contrary to the opinion of Gallatin, who wished to husband the resources of the treasury in order to pay off the national debt as rapidly as possible. The commercial prosperity of the country at this period was at a high level; our neutral commerce took advantage of the European wars; exports and imports were large, and customs revenues for several years continued to increase by more than $1,000,000 annually. Notwithstanding the loss of the internal revenue duties and the issue of a new loan of $11,250,000 required by the purchase of Louisiana, the position of the treasury steadily improved, so that the debt was reduced from $86,000,000 in 1804 to $45,000,000 in 1812. The success of this operation was largely due to Gallatin's insistence that $8,000,000 should be annually appropriated to the extinction of the debt regardless of all other demands. Gallatin also introduced the practice of rendering annually to Congress a statement of the finances, and during his administration the policy of making appropriations specific was established.

In order to meet the expenditures of the war with Tripoli a special revenue was created in 1804 by the imposition of additional duties of 2½ per cent on all imported articles paying ad valorem duties; this was known as the Mediterranean Fund. In 1806 the import duty on salt was removed. In 1809 there was a temporary check to the good fortune of the treasury owing to the Embargo Act, but upon its repeal there was prompt recovery. Irritation between England and the United States was deep-seated, and in 1812 the treasury faced a situation for which it was ill prepared. War with England made a heavy loss in customs revenue, for a large part of the commerce of the United States was with that country; there was no internal revenue system to fall back upon; and the estrangement of the wealthy merchants of New England who opposed the war, made it difficult to borrow money in that section. The failure to renew the charter of the United States Bank in 1811 also deprived the government of a substantial agency either for making temporary loans or selling securities. Moreover, there were intrigues in the Republican party directed against Gallatin; his influence was so far weakened that in May 1813, he retired from the treasury.

The extraordinary demands occasioned by war were at first met by loans in which short time treasury notes played an important part. Between 1812 and 1816, $84,400,000 of government stock was sold, of which $17,700,000 was redeemed during the period, making a net increase of $66,700,000; $36,600,000 treasury notes were issued of which about one half were redeemed, leaving $18,400,000 outstanding at the close of the war. Funds were borrowed under disadvantageous terms, a large part of the stock being sold at a discount; of $41,000,000 borrowed up to the end of 1812, New England contributed less than $3,000,000. The financial distress was also aggravated in 1814 by the suspension of specie payments by local banks in all sections of the country except New England; thus the receipts of the government, both for taxes and loans, were in depreciated currency. It is estimated that for loans of over $80,000,000 the treasury received but $34,000,000, as measured in specie. Treasury notes were issued under five different acts; the earlier ones were in denominations of less than $100 and were not designed for circulation; before the close of the war, however, provision was made for the issue of notes as low as $3.00. With the exception of the last issue all notes were redeemable in one year; and again with the exception of the small notes, all bore interest; none of the notes was legal tender.

Congress too tardily endeavored to enlarge the sources of fiscal supply by increased taxes. The customs duties were doubled at the outset, but this gave little strength, since commerce was almost at a standstill. In 1813 a direct tax of $3,000,000 was levied and internal revenue duties were revived. It takes time, however, to establish the machinery of a new tax system, and no receipts from either of the above sources appear on the books of the treasury accounts until 1814. As a consequence of this feeble financiering, deficit followed deficit, amounting in the years 1812–15 to $68,600,000. Gallatin was succeeded in the treasury by William Jones and George W. Campbell, neither of whom was able to cope with the situation, and in October 1814, Alexander J. Dallas, a conservative Republican and friend of Gallatin, was made secretary. The mischief, however, had already been accomplished, and Dallas was unable while the war lasted to extricate the treasury from the embarrassments occasioned by inadequate taxes and depreciated currency. See UNITED STATES — FINANCES OF THE (1816–61).

DAVIS RICH DEWEY,
Massachusetts Institute of Technology.

24. United States Westward Movement. The curtain which veiled far Cathay and the mystic East was raised during the Crusades, but the trade of Europe was blocked by the intrusion of the Ottoman Turks. Adventurous captains, barred by the scimeter in the East, by the cold of the North and the heat of the South, sailed boldly into the West, and consequently brought civilization to the Americas on the eastern rather than the western coast. The American people took up the extension of this triumphal course, and, following the same direction, carried civilization directly across the continent of North America from the Atlantic to the Pacific. In less than three centuries, they traversed the 3,000 miles of continental interior, conquered nature, dispossessed the savages, evicted European rivals, and set up a high form of civilization and government, where formerly were only wilderness and barbarians. This achievement is commonly known as "the westward movement."

Speculation is exhausted in conjecturing the probable result had civilization been cast on the Pacific instead of the Atlantic coast, and been compelled to make its way across the continent from west to east. Recalling the many chance discoveries along the Atlantic because captains mistook indentations, one may imagine the numerous accidents which must have resulted along the almost solid Pacific coast, and the hindrance to the spread of the people because all must come through a few ports. The narrow Pacific coast plain cannot be compared in size with the great Atlantic plain as a place for recruiting strength before commencing the overland jour-

ney. Passing eastward, the inhospitable desert between the Sierra Nevada and Rocky Mountains would have met the emigrants instead of the fertile lands of Tennessee, Kentucky, and Ohio. An eastern movement must have been delayed for generations by the impenetrable Rockies and the arid region at their base, just as the western movement stands to-day blocked while developing a national irrigation scheme. If there be a national destiny shaping our end, it was surely in evidence when directing Columbus to the eastern instead of the western coast.

In 1619, the first successful attempt at colonization within the confines of the British dominions of North America was made at Jamestown, Va. In 1775, the first representative body of men gathered at Boonesborough from four incipient settlements in the present State of Kentucky. It had taken 165 years for the English speech to cover the Atlantic plain, cross the Alleghany Mountains, and set up free government within the Mississippi basin. In 1820, Missouri was admitted, the first State beyond the Mississippi River. Louisiana is not considered because her population was sufficiently complete for admission when she was purchased. It had thus required only 45 years to go from the Alleghanies to the trans-Mississippi region. In 1850, California, the first Pacific State, was admitted. Thirty years only had been required for the people to traverse the remaining half of the continent. The rapid increase in the rate of speed may be attributed to the growth of the protective efficiency of the central government, to the increasing number of people, and especially to improved means of transportation.

The Atlantic Coast Plain, upon which the present United States was born, is a long, narrow strip of comparatively level land, trending from northeast to southwest, and lying, generally speaking, between the Appalachian mountain system and the Atlantic Ocean. Its width varies from 50 to 200 miles, depending on the approach of the various flexions of the coast to the mountains. Within this long stretch, the battles of the Revolution were fought with a few small exceptions. It was essentially a coast war, the troops being frequently conveyed by transports from one point to another, and a French fleet co-operating with the army during the last general campaign. During the war, the Continental Congress sat at Philadelphia, Baltimore, York, Princeton, Annapolis, Trenton, and New York, never more than 150 miles from the coast. It is said that during one of the many dark hours of the contest, Washington expressed his determination, in case of ultimate defeat, to retire with his remaining comrades to the fastnesses beyond the Alleghanies and there continue the unequal contest. Evidence is not wanting to show that many of Washington's fellow officers and comrades contemplated future residences in the "back lands," as the region beyond the mountains was called. They were "back" lands in the sense that they did not drain through the Atlantic or "front" way. Although claimed by the king *ex officio*, as "crown lands," these lands as far west as Britain ruled were demanded by some of the colonies because their charters covered them. Others thought that the Indians owned the lands beyond the mountains, and endeavored to purchase them from the aborigines. The king still insisted that the limits of the 13 colonies terminated on the watershed of the mountains. He did not except even Pennsylvania from this rule in his proclamation of 1763. But the political rebellion arose so soon that the proclamation was virtually null and void, if the Americans should succeed in securing Independence.

Several attempts to penetrate the western country were made about the time of the outbreak of hostilities between the colonies and those in authority. The country-dwellers in the uplands of Virginia and North Carolina were restless, fearless and self-reliant. They needed only a rifle, powder and ball for equipment. In this and similar respects, they were the antipodes of their urban-dwelling brethren of the north Atlantic plain. A glance at a map will show that in western North Carolina, the watershed has leaped over to the most easterly of the mountain ridges, leaving a large space of the "back lands" within the limits of this State and Virginia. The Yadkin approaches the water shed upon the eastern side very closely, while the western slope is drained by the Watauga, the French Broad and other headwaters of the noble Tennessee River. Here was probably the earliest carrying place of any magnitude between the Atlantic plain and the Mississippi basin. Over it passed Daniel Boone, Robertson, and other adventurous spirits to form the Watauga Association in the back country in 1772. The map will also show that other streams tributary to the head of the Tennessee take their rise in long parallel valleys in southwestern Virginia. Among them are the Clinch, the French Broad, and the Holston. They are almost touched by the headwaters of the James and the south branch of the Potomac. Over the many short portages between the two systems came such hardy men as John Sevier and Richard Henderson to meet the North Carolinians in northeastern Tennessee.

These scattered Watauga settlements, largely in what is now Carter County, Tenn., not only set up the rudiments of government, but also furnished a supply for two great streams of emigrants to the West. One branch passed directly down the Tennessee River, founded Knoxville, and planted innumerable villages and homes throughout eastern Tennessee. John Sevier attempted to collect them into his state of "Frankland" or "Franklin," as it was later called. The other branch of people turned directly west across the Clinch and Powell Mountain, passed through the Cumberland Gap, and found its way into the limestone valley of the Elkhorn, the "blue grass" region of Kentucky. Watauga hunters encamped there heard the news of 19 April 1775, and named their camp "Lexington," a name the city bears at this time. When independence was announced, there were several thousand people maintaining their stand against the hostile savages and the British in the present States of Tennessee and Kentucky. Uncertainty of ownership left them almost entirely unprotected. As a defensive measure, George Rogers Clark headed a number of them, together with some Virginia recruits, and marched to destroy Kaskaskia and other former French posts now held by the British. Virginia in this way doubly confirmed her claim to the land north of the Ohio. It is

worthy of note that it was a Virginia-Kentucky enterprise, and formed no part of the claims put forward in the treaty of peace for American ownership of the "back lands."

The Watauga route, although the first to be used in popular migration, was outranked in age by the Potomac-Monongahela portage path. it was the one which young Washington chose across the mountains when warning the French from the "back lands"; along it Braddock led his ill-fated expedition; and over it Washington brought back the survivors of that disastrous excursion into the Western country. It required the shortest carrying over the Allegheny watershed and evidently awaited only the pacification of the Indians north of the Ohio to become the great thoroughfare to the West. The conduct of the Revolutionary War had made the Lake Champlain route to Canada familiar. At Albany, the Mohawk invited travelers to the west to follow its charming valley to Lake Oneida, and thence by the Oswego River to Lake Ontario. Washington, Lafayette, Madison, and Hamilton made short trips in this direction after the war. But it was a long and perilous way to the Western lands, involving passing through the undependable Iroquois, a canoe trip on two great lakes, and a long portage about Niagara Falls. This route, destined to become eventually the most popular, was very tardily developed. A fourth route would be opened in time about the southern end of the mountains, but not until the Creeks and the Cherokees could be removed from the way or pacified.

These were the four great ways from the Atlantic to the interior. Pioneers on foot and in "dug-outs" pushed their way across prairie, through forests, and along the streams. The northern portage is now used by the New York Central and West Shore railways and by the Erie Canal; the Pittsburg route by the Pennsylvania and Baltimore and Ohio railways; the "Wilderness Route" by the Chesapeake and Ohio, the Norfolk and Western and the Southern railway lines; and the extreme southern route by the many east and west systems centring in Birmingham, Ala. In the many changes from "dug-out" to palace car, the people have never abandoned the line of least resistance for travel.

Among the many inducements held out in recruiting for the Revolutionary service was the promise of "a good farm." Led by visions of this bounty land, officers and men, at the close of the war, banded themselves together for the purpose of migrating to the "back lands," which had been won by their valor. This they would do not only for bettering their condition, but also for protecting the frontier against the Indians, the Spanish in the Floridas, and the British in Canada. Efforts to satisfy these ambitions brought about the cession of the western lands by the States to the national government, the creation of the Northwest Territory (q.v.), the sale of 1,000,000 acres to the Ohio Land Associators, and the first settlement north of the Ohio made at Marietta, 1788. However, occupation of the land north of the river progressed but slowly until the victory of Wayne over the Indians and the resulting treaty of Greenville in 1795.

The year 1790 marked an important stage in the history of the westward movement. The Constitutional government under President Washington had been established the year before. One of its duties was to make a numbering of the people so that an equal representation in Congress might be had. The first census taken in 1790, enabled us to know the number of people in each county and town and hence the distribution of population. It showed that little "islands" of people had run far ahead of the main body and established themselves, as already described, in Tennessee, Kentucky and Ohio. Not more than 5 per cent of the 3,929,214 total population lived west of the Allegheny watershed. The front wave of people extended almost uniformly along the eastern slope of the mountains, throwing out long arms along the four routes to the West. The average distance of the people from the ocean was not more than 250 miles. The Americans were still coast dwellers. The West was as yet unknown. The most thickly settled portions lay in an irregular line from Portsmouth, N. H., to Baltimore, Md. Here dwelt more than 60 people to the square mile.

The westward advance, as suggested heretofore, was hindered constantly by the hostility of the savages. Perforce the national government was gradually given control of them by the States. It recognized them as foreigners so far as making treaties with them for the possession of their land was concerned. Scores of these treaties were made, establishing lines beyond which the whites solemnly promised not to migrate and east of which the Indian agreed not to molest the white. But it was impossible for the government to restrain the land-hunger of the citizen when confronted by a savage. On the frontier, treaties were secondary to force. These broken and obsolete Indian treaty lines, from which the savages were driven back, bear a striking resemblance to the positions occupied at different decades by the foremost line of the pioneers. In order to provide for the unstayable advance of population, increased constantly in numbers by immigration from Europe, the national government was convinced that something like a general policy of treating with the Indians must be formulated. The whites sometimes surrounded the Indian lands, threatening to annihilate the savages, if they did not move on. Thus in 1820, the advance line of pioneers extended from Kentucky in a strong belt down through Tennessee and western Alabama to Louisiana; but between these people and their brethren in South Carolina and Georgia lay hundreds of miles occupied only by the savage Creeks and Cherokees. Toward the north, civilization had spread up from the Ohio River about to the latitude of Vincennes and Saint Louis, but further advance was barred by the Pottawatomies. With difficulty the whites were kept from annihilating whole tribes. Peace and preservation for the Indian as well as for the white could be secured only by keeping the former well in advance of civilization, assigning them to some remote portion of the country which they could hold *en bloc*. Here they could dwell perpetually. See TREATIES, INDIAN.

Many presidential messages, beginning with those of Jefferson, advocated such a disposition of the Indian. In 1839, a revision of the laws regulating trade with the Indians was made.

One provision set aside all the land lying to the west of the Mississippi River except the States of Louisiana and Missouri and the Territory of Arkansas to be an "Indian country." Within a few years it received the Creeks, the Seminoles, the Cherokees, Chickasaws, Choctaws and other warlike tribes from east of the Mississippi. Some came willingly, others by compulsion. Incidental to their removal occurred the Seminole War and the Supreme Court case of Worcester *v.* Georgia. Gradually the "Indian country" has been scaled down to the present Indian Territory. Released from the barrier of savages, population moved forward more evenly and brought portion after portion of the new lands to statehood. The admission of new States to the Union was made possible by the western movement. So early as Revolutionary days, the number of people pouring across the mountains showed that some provision must be made for governing the land beyond the undisputed limits of the 13 States. It might be held as a tributary province, it might be left to protect itself, or it might be nourished by the parent until it reached a stated point and then be admitted to equal rights in free government. In 1780, Congress, wishing to persuade the States having claims on the "back lands" to yield them, promised that it would not hold land entrusted to it as subject territory, but would erect it into states of moderate size as rapidly as population should warrant. This promise had the desired effect and has been redeemed 32 times by the national government. With the exception of Maine, created from a Massachusetts Bay province; Vermont, claimed by several adjacent States, and Florida, purchased from Spain, the new States have been created uniformly on the western side of the old 13 and have been due entirely to the western migration across the continent. New accessions of territory brought land for these new States. The additions of Louisiana, the Floridas, Texas, California, and Oregon have come from the movement and demand of the people. The invariable condition of these acquisitions has been that trade allures the American into a neighboring foreign possession. He becomes involved with the authorities, or friction ensues in some other way, and he then demands that his flag shall follow and protect him. Trade never follows the flag, but trade demands that the flag shall follow and protect it. By means of these additions the people have spread over a territory ten times that of the original 13 States.

It is evident that the front line of people will always be at right angles to the direction of movement, representing, as it does, the foremost wave of advance. This is the "frontier." Technically it is the long, narrow advanced strip which contains more than two people and less than six people to the square mile. The latest aspect of the frontier is associated with the Great Plains and cowboys; but the frontier in past times has occupied successive positions from the Alleghanies westward at each succeeding census. Its various positions remind one of the old sea beaches on a geological map. When young Andrew Jackson migrated to Tennessee and lodged in the "lean-to" of Mrs. Donelson, built against her log cabin, he was on the frontier of that day. When Abraham Lincoln's mother died 18 miles from a physician in a southern Indiana cabin, it marked the hardships of the frontier. When "border ruffians" contested with "Thayerites" for the possession of eastern Kansas, the frontier had reached that point.

Manifestly, if the start had been equal all along the line and the rate of progress equal, the frontier line would have been almost a straight line. But the topography of the land and the hostility of the Indians prevented such a regular advance. Long arms of people ran up the streams, islands of people were formed far in advance, and deep indentations frequently resulted from some hindrance. The frontier of 1830, for example, extended in a great convex westwardly curve from Detroit, Mich., to New Orleans. It threw out so many projections along the Wabash, the Illinois, the Mississippi, the Missouri, Arkansas and Red rivers that it was 5,300 miles long. Ten years later it had filled out these inequalities so much that although it extended from Green Bay, Wis., to Corpus Christi, Tex., it was only 3,300 miles in length.

No prediction could be safely made as to direction or rate of motion. A rush or "boom" would make a fully populated region out of what was yesterday an untenanted wilderness. The census of 1830 showed a barren sweep about the head of Lake Michigan with less than two white men to the square mile except in the lead mines in northern Illinois and a group about Kalamazoo, in southern Michigan. Ten years later the lake was skirted from north of Milwaukee far down into Indiana by from 6 to 18 people to the square mile. Within the decade, it had leaped through the intermediary stage of the frontier. In 1830, Mississippi was settled only in a narrow strip across the southern part. Ten years later the entire state, except a spot near the Gulf, was covered with a population in many places of 20 people to the square mile.

The frontier in 1860 lay almost due north and south just west of Iowa and Missouri. It was the line-up for the final dash across the Great Plains, the best known and most picturesque of all the positions of the frontier. In 1890, it had assumed its highest achievement and was in its proudest position. Beginning at the Canadian border near longitude 100° it came down through the Dakotas and suddenly turned westwardly, encompassing the larger part of Colorado, and rounding down into Texas on the south. But ten years later, population had so shrunken in the "dry farming" districts of Nebraska, Kansas, and Colorado, that the line had fallen back, almost coincident with the meridian of 101° north latitude from the Canadian boundary to the Rio Grande. For the first time in its history, the American frontier had retreated. Nature, driven back step by step through the conquering will and forces of man, seemed to have taken her stand in the arid regions and to defy further encroachments upon her realm. National irrigation under the form of internal improvement may be the weapon with which she will again be defeated.

The movement of population, which conquered the continent and unified the American people, was not only a westward movement but a due west movement. Men follow parallels of

latitude because of similarity of climate, occupation, products, foods, and dress. The constant tendency to migrate due west is shown in a study of Americans living in one state who were born in another. New York, to illustrate, has contributed more citizens to New Jersey than to any other State; then to Michigan, Pennsylvania, and Illinois in decreasing order, but all to the westward. Georgia has sent more of her citizens to Alabama than to any other State; then to Texas, Florida, Tennessee, Arkansas, and Mississippi, in decreasing ratio. Arkansas and Iowa are about equally distant from the Atlantic, the place of setting out. But in the onward march, 26 New Yorkers found their way to Iowa for every one to Arkansas. On the other hand 57 South Carolinians have chosen to live in Arkansas for every one who chose to remove to Iowa. The State of Washington has drawn most largely upon Illinois and Texas most heavily upon Tennessee. All this had a most important bearing on northern and southern sectionalism.

The due west movement has been accompanied thus far by a very slight return movement, except beyond the Rocky Mountains, where the entire migration is the reverse of that to the east of the continental divide. Thus Virginia has given to Missouri 35 citizens for one received in return. But with the exhaustion of the western public lands, the growth of cities, and increased means of communication, the westward movement will gradually wane. As evidence of this, it may be noted than in 1880, Illinois had given to Iowa six persons for one received, but in 1900 the ratio had fallen to three to one. During the same period, the ratio of exchange between New York and Colorado had fallen from 75 to 1 to 22 to 1.

This return movement will be increased by the improved methods of applying steam and electricity to means of transportation. Mention has been made of the increased rate of motion owing to these and similar improvements. The waterways were the ready-made highways for the pioneers. Supplemented by carrying or portage paths from stream to stream or across watersheds, they formed a network of routes of travel, not only in a drainage basin, but from basin to basin. No small amount of the proverbial American "initiative," the capacity for doing things, must be attributed to the manner in which obstacles were overcome in this primitive travel and transportation.

The American frontier has passed forever. Fully equipped civilization stands at the edge of the arid region. It is met in the mining cities of the Rockies. The American pioneer lives only in the gratitude of the people. The influence which the frontier and frontiersman have wrought on American life have been suggested frequently in preceding pages of this article. A supplemental summary finds that the frontier has produced (1) a constant renascence of the principles of free government upon which the republic was founded. Western State constitutions have been notedly more liberal than those of the Eastern States. Eastern statesmen have been rejuvenated by contact with the crude sons of the West. A jealousy of their republican institutions, amounting almost to a madness, permeates the western people, sometimes making them liable to harbor political and economic vagaries. (2) The frontier has helped keep alive the principles of democracy in America, notwithstanding the enormous accumulations of riches which tend naturally toward begetting social distinctions. Among the frontiersmen personal strength and personal merit outweigh descent and social rank. (3) The needs of the people in the remote regions, met by Congress under the general name of "public improvements," have tended constantly to widen the scope of the national government. The scruples of "strict construction" must give way before the clamor of the people, as Clay easily demonstrated. (4) The public domain, by the easy arrangement of purchase, has furnished farms and homes for millions of immigrants, who would otherwise have crowded into the cities to become consumers of food, but who, as agriculturalists, have become producers of food. (5) The missionary spirit has been kept alive by the needs of both savage and civilized man along the border. Frequently colonies were transplanted to the wilds, carrying churches, schools, and even colleges with them. Galesburg, Ill., and Granville, Ohio, are examples. (6) The vacant land in the West has offered an asylum for theorists and philanthropists. The Mormons, the Icarians, the Harmonists and the community at Greeley, Col., are instances of this kind. (7) Guarding the frontier has furnished a *raison d' être* for maintaining a small force of national troops until such time as the growth of cities furnishes a new task. The deeds of daring performed by both rangers and regulars along the border will be handed down among American traditions. (8) Free education has been fostered through the provision for granting a certain portion of the public lands for public schools and for colleges. (9) The tillable land of the West has made us independent of other nations and has largely turned their dependence for food supply on America. In a similar manner, the western mountains have furnished a mineral supply for the manufacturing demands of the older portion. Cities and villages have cut down materially the food-producing area in the older States, but the West is still unhampered. Excluding Alaska and the other outlying possessions, the centre of area of the United States is in northern Kansas, but the centre of population is in central Indiana, more than 700 miles behind.

"The West" has always been a purely relative term and so remains. To the New Englander, it means New York or Ohio. To the people of those States it means the trans-Mississippi region. In Utah, it means California. In 1832, Chicago was in the far West. About that date, a man conceived the idea of killing hogs, packing them in barrels with salt, and shipping the pork by lake to Detroit and Buffalo, instead of driving the animals on foot or shipping them by boat, as was the practice. By the end of the century, Chicago was "packing" 2,000,000 cattle annually and 7,000,000 hogs, sending the meat in refrigerator cars to supply the hungry Eastern States and Europe. As early as 1830, a long, thin projection of people ran up the Missouri River to the mouth of the Kansas, following the route of Lewis and Clark a few years before. It was prophetic of the future collecting and distributing point of Kan-

sas City, 1,500 miles from the starting points along the Atlantic.

So long as wagon trains toiled over prairie trails, or pony expresses handled light packages and the mails, or the overland coach carried a limited number of travelers, the resources and capacities of the great West remained untried. But, in 1862, two companies accepted the offer made by the national government of land and loans to construct a continuous railway from the Missouri to the Pacific. Precedent for this assistance of the government was found in the custom of granting certain portions of the domain for constructing means of access, thereby rendering the remaining land more valuable. In 1869 the line was opened and it sounded the death knell of an isolated West. When the road was begun, there were only 14,916 miles of railway beyond the Mississippi. When it was completed, there were 22,863 miles in operation in that remote region.

The Great American Desert, as our fathers mistakenly called the Great Plains, is now fretted over with railway lines. In its midst lies Kansas, Nebraska, and the Dakotas, among the largest corn and wheat producing States. West of the Mississippi lie Texas, Montana, Oregon, and New Mexico, containing more sheep than the remaining States combined. West of the Mississippi lie California, Idaho, and Colorado, producing more precious metals than all the remaining States. Seven-ninths of the manufacturing is still carried on east of the Mississippi. Nearly three-fourths of the people dwell on the eastern side. But the river, running north and south, is no longer a menace to the perpetuation of the republic as it once was. Migration and trade run east and west, and the great Father of Waters is spanned by more than a score of railway bridges, linking the people together along modern lines of transportation. These trunk lines bind together the East and the West, the old and the new, sire and sons, manufactures and raw products, storehouses and grain fields. Home ties are no longer sundered by migration; sectionalism is no longer begotten of distance; but the people move freely to and fro over soil which their forebears wrested from nature in order that the experiment of a confederated republic might be tried on the largest scale yet attempted.

EDWIN ERLE SPARKS,
Professor of History, University of Chicago.

25. United States — Monroe Doctrine. The Monroe Doctrine is so called because it was first officially announced by President James Monroe, in a message to Congress 2 Dec. 1823. The immediate cause of the declaration of this doctrine was a double danger to America from the aggressions of European nations. Russia, it was feared, was likely to extend her colonies southward from Alaska until California would be in danger, while Spain, it was expected, would make a great effort to recover her revolted American colonies, which had thrown off her authority and had established governments of their own. After consulting with his friends, and powerfully urged by his secretary of state, John Quincy Adams, President Monroe sent his famous message to Congress in which he declared "that the American continents by the free and independent condition which they have assumed and maintained are henceforth not to be considered as subjects for future colonization by any European powers." He further declared that "with the governments who have declared their independence and have maintained it and whose independence we have . . . acknowledged, we could not view any interposition for the purpose of oppressing them, or controlling in any manner their destiny, by any European power in any light than as a manifestation of an unfriendly disposition toward the United States." This position in regard to the relation between European nations and the nations of America the United States has consistently maintained from the days of Monroe to our own time. See MONROE DOCTRINE.

W. H. MACE,
Professor of History, Syracuse University.

26. United States — The New Democracy and the Spoils System. Up to 1828, the spoils system was unknown in national politics. Jefferson had in 1801–1803 removed many opponents, but he had not made political service an important qualification for office. From that time until 1828, all Presidents were of one political party, there were few removals, and the management of the civil service was conservative, honest, and fairly efficient. Very different was the condition in many of the States. In Pennsylvania in 1799, in New York in 1801, Republican victories had been followed by the wholesale removal of Federalists. The swiftly succeeding party changes brought retaliation, and both parties were soon committed to the practice. Popular approbation confirmed it, and popular apathy allowed appointments to be made more and more exclusively for political reasons; changes were so numerous that merit could not be investigated. The New York constitution of 1820 embodied an attempt at reform. It abolished the Council of Appointment, which consisted of four senators annually elected by the House of Representatives, and which had entirely controlled appointments since 1801, and concentrated the power and responsibility in the hands of the Governor and Senate. The number of appointive offices was greatly decreased by giving to the people the election of militia officers and justices of the peace. The spoils system was, however, too firmly intrenched to yield, and the Albany Regency, a combination of politicians skilful in making use of appointive offices for political purposes, and in controlling the minor elective offices by means of caucuses, became the dominant power in the State. The advantages of the spoils system in building up and holding together a political organization did not escape the attention of politicians of other States. Proscriptions were carried out in Rhode Island in 1810, in Massachusetts in 1813, and, while they were unpopular and did not lead to a permanent introduction of the spoils system there, they indicate that in these States, and probably in others, there existed a class anxious to see the public offices turned over to the politicians. Debarred from using the State service for their purposes, such men naturally looked to the national salaries; nor in this were they alone. The more fortunate politicians of New York and Pennsylvania had already a little tinged with politics the national service in their States, but they would not rest satisfied until they could elect to the Presidency a man who approved their principles and would make the spoils system national. The existing state of affairs was

displeasing not to the politicians only, but to the people, particularly those of the frontier States. The wholesome distrust of life-tenure in executive and legislative office, which had been so keen during the Revolutionary period, had extended to administrative office; the reasons for regulation had been forgotten and limitation had come to be considered as an end in itself. State constitutions and laws began to substitute a fixed term for tenure during "pleasure" or "good behavior," and in 1820 Congress limited to four years the tenure of the majority of United States officials. Such legislative action did not immediately lead, and was not intended to lead to, actual change; it was to give the people the power to make such change, if necessary. In 1828 there was a popular feeling that the time had come. The long tenure, and in some cases too eminent respectability, the book learning, of the existing servants of the people, had made them for some time feared and distrusted. In this situation, the charge of "bargain and corruption" against Adams and Clay seemed proof positive: the case against the civil service was complete. Joined to this distrust of those in authority, was a superb confidence in the honesty and capacity of the people. Jackson said in his first annual message: "The duties of all public offices are, or at least admit of being made, so plain and simple that men of intelligence may readily qualify themselves for their performance; and I can not but believe that more is lost by the long continuance of men in office than is generally to be gained by their experience."

Jackson Introduces the Spoils System.—The election of Jackson was brought about by the combination of these two elements. Van Buren had brought the support of the organized Democracy of the North and East, of the politicians and the people that they represented. Jackson himself stood for the frontier democracy, with its confidence in itself and distrust of those it did not understand. The enormous crowd of office-seekers at Washington on 4 March 1829 left no doubt as to what course the government was expected to pursue. It is useless to discuss the personal responsibility of Jackson and Van Buren for the subsequent course of the administration. They were but carrying out a policy in which they believed and which the people had elected them to put into effect.

Of 610 officers of the presidential class, that is, those appointed by the President with the advice and consent of the Senate, 252 were removed during Jackson's administration. This number is not large, but there are facts which make this proscription the most noteworthy in our history. The majority of the removals were made in the spring and summer of 1829, and so attracted more attention than those of Jefferson, which were scattered through several years. Among those changed, moreover, were included nearly all the important officers, many of whom controlled large numbers of subordinates and carried on proscriptions of their own. In addition, the removals were to some extent localized, for few were made in the old South. In the North and West, then, by far the greater proportion of the salaries and influence of the national service changed hands. The specially distinguishing feature of this proscription, however, was the nature of the qualifications for office demanded. Up to this time, ability to perform the duties of the office, geographical fitness, good local standing, and political opinions in sympathy with the appointing power, had been required with varying emphasis. Service to the party was sometimes rewarded, but incidentally, at no time being actually essential. Under Jackson, ability became incidental, and party service the main requirement, not only past service but future usefulness as well. Newspapers were then not generally self-supporting and many editors received offices to enable them to pay their debts and improve their papers. Nor was loyalty to party alone sufficient. Unless one were a friend of Jackson or could obtain his ear, it was decidedly advantageous to belong to the Calhoun faction, and have his friend, General Duff Green, editor of the 'United States Telegraph,' press one's suit; or to advocate the succession of Van Buren and receive the aid of the powerful interests he represented. By 1831, the salaries of office-holders were occasionally assessed for party purposes, and, by the close of the administration, this practice was well recognized. The spoils system had been introduced into the national service: the question of its continuance remained.

The Whigs Establish the Spoils System.—The opponents of Jackson seized upon his administration of the civil service with avidity. They could not conceive that the people would indorse a practice that appeared so impolitic and wasteful. The Senate did not reject many of his nominations, but in 1831 several resolutions were introduced to show its disapproval and in 1835 an elaborate plan to regulate the control of the patronage was formulated. Webster, Clay, White, and Calhoun delivered able speeches filled with high ideals of public service. When examined, however, the plan proposed is found to be purely an attempt to limit the power of the executive. The President was to present to the Senate the reasons for removals. Jackson refused to yield. His friends defeated the Senate's proposal, those whose nominations were rejected received compensation in other ways, and on 10 Feb. 1835 he peremptorily refused to send the Senate any information concerning the removal of Gideon Fitz, asserting that that body had no right whatsoever to investigate removals. While no tangible results were obtained by this senatorial opposition, the patronage was to play a prominent part in the campaign of 1840. The crisis of 1837 struck a staggering blow at the civil service. Public servants who had speculated with government funds were caught without property to pay their loans: of 67 land officers, 64 were said to have been at one time in default. This condition was partly due to downright dishonesty, as in the case of a Samuel Swartwort, collector at New York; more, and especially in the West, to lack of business education. A treasury agent wrote of "a certain looseness in the code of morality, which here does not move in so limited a circle as it does with us at home." Some such experience was inevitable in so great a crisis. Its extent was due to the carelessness with which appointments had been made, and the Van Buren administration suffered as if alone responsible for the spoils system and the breakdown in the civil service. Reform became one of the most popular issues of the campaign, and the method

of dealing with the situation proposed by the Whigs, the limiting of the power of the executive, was one that appealed strongly to their Southern States rights supporters. To nothing did the election of Harrison so strongly commit his party as to the abolition of the spoils system. Having come into power, they failed to enact their legislation planned in 1835, although in full control of Congress, and although the subject was brought up. To remove many of the incumbent officers was necessary to their reform, but in filling the vacancies thus created they were pledged to return to the pre-Jacksonian qualifications for office. Instead, while insisting upon ability somewhat more than Jackson had done, they continued to make party service the chief essential. The man appointed collector at New York was described to Peter B. Porter by Thurlow Weed as follows: "Although not personally popular, [he] is represented as possessing an extraordinary share of tact or stratagem, and as being able, by his skill in planning and combining, and his untiring industry in executing, to produce the most astonishing political results. That, with the office of collector [which Weed considered as second only in importance to that of Postmaster General] he could on all important occasions, command the vote of the City of New York, and, per consequence, of the State." In 1841, then, the spoils system had been recognized by both parties and might be considered established.

The Significance of the Spoils System.—The continuous progress of the spoils system from a few States to the nation, from the nation into other States, from one party to the other, until it became a thoroughly national institution, indicates that it possessed some principle of vitality. The reasons thus far offered are insufficient to explain its growth. No practice could become so firmly fixed unless it served some fundamental lasting use. The spoils system was in fact a concomitant and probably a necessary one, of the democratic revolution which made Jackson President in 1829 and established the rule of the people in the United States. The people cannot govern unless organized. They may overthrow old leaders in a revolution, they may elect new leaders by a plebiscite, they may even determine the policy of the government in moments of great national enthusiasm, but they cannot exert a steady control of the details of administration unless their lagging interest is kept up and their views given a means of expression by organization. Organization, however, requires leaders, not only leaders of ten thousands who receive a reward of glory, but humble leaders of tens, ward-heelers, who enjoy little honor. Public interest attracts some to perform this function, but a sensitive democracy requires that these men shall be of the "people," not men of wealth; it would not have politics a business of class, as it largely is in England. Now, however public-spirited a poor man is, he has to earn a living. Such motives, moreover, would not attract a sufficient number. Material inducements are necessary, and some substantial means of supporting party organization must be found. To supply this is the function of the spoils system. The civil list becomes the pay roll of the party, and the recipients of public salaries are expected to serve the nation in the double capacity of working officials and party organizers. The rise o the spoils system was, then, inextricably joined with the rise of party organization and of democratic government, and this connection has continued to the present day (1904). That such connection is permanently necessary does not follow, but, if it is to be done away with, a substitute must be provided, for it fulfills a necessary and useful function. Politics may become a recognized profession with legitimate rewards, the people may become less suspicious of men of wealth, party organization may be simplified and fewer workers required — in some way the cause must be removed; direct attack can never succeed.

The Struggle for the Patronage.— It follows from this inter-relation of the spoils system and party organization that the control of the patronage would often mean control of the party. Hence the struggle to secure this control became very bitter, and raged not merely between the two parties but also between the different branches of the government. The Constitution gives the House of Representatives no share whatsoever in the appointing power. In 1826, however, it was proposed that the delegations select the newspapers to be given the printing of the laws. In 1862 each member was allowed the appointment of two cadets at Annapolis, and in 1899 General Grosvenor proposed that all government offices be divided equally among the congressional districts and that the recommendations of the congressmen be requisite for appointment. The Senate, on the other hand, possesses rights under the Constitution and has always fought to have them respected. In 1789 Congress decided that the Senate had no power over removals. This interpretation was continually attacked, but for a long time unsuccessfully. The House of Representatives did not sympathize and a two thirds majority would be necessary to override the almost inevitable veto of the President. Under Johnson, however, circumstances were favorable. The executive power had grown abnormal during the war; the patronage had become so extensive that it was feared even before the death of Lincoln; the actual President was hated, and his opponents had a two thirds majority. In 1867, the Tenure of Office Act was passed, providing that Presidential officers could be removed only with the advice and consent of the Senate. The friends of President Grant procured the modification of this act in 1869, but, in spite of protests and with little to say in its defense, the Senate maintained the law until 1887, when finally it was repealed and the interpretation of 1789 restored.

The Machinery of the Spoils System.—While legally the President has maintained his power except for this short period, in actual practice he has long been greatly restricted. It is of course impossible for him to be personally cognizant of the conditions and the qualifications of candidates for all the positions scattered over the country. Assistance has always been necessary and it has been natural to consult the members of Congress best acquainted with the locality. This was done from the foundation of the government, but, with the development of the spoils system, the requests for advice became more a matter of routine and the obligation to accept it became more binding; the discretion of the central government became a smaller

factor. All representatives in sympathy with the party in power began to expect as a matter of course to control the appointment of minor officers, as rural postmasters, within their districts. Lincoln's correspondence shows that in 1840 he considered this a well-established rule, and as President he abided by it. Often courtesy extends this privilege to congressmen of an opposing party, notably to those from the South, and in cases where a fixed number of new offices is created for every congressional district, as in the census appointments for 1900. With regard to all local offices of the Presidential class, the Senators from the State in question expect to be consulted. In the early history of the spoils system, the delegations composed of all members of Congress from the Several States settled such questions; under Pierce, they dictated nearly all important appointments. Lincoln wrote that the two Rhode Island Senators, the two old representatives, and one of the new ones, combined in favor of one candidate, and added: "While under peculiar circumstances a single member or two may be overruled, I believe as strong a combination as the present never has been." After the passage of the Tenure of Office Act, the Senators waxed in power at the expense of the Representatives, their assumption reaching its height when Conkling and Platt in 1881 retired from the Senate because they were not allowed to control the New York appointments. The repeal of this law, however, has not restored the delegation to its former position. General and foreign appointments are oftentimes divided pro rata among the States and assigned in the same way as the local offices. This was understood in 1849, was a fixed rule under Pierce, and has been the general practice ever since. The extension of the influence of members of Congress curtailed that of the secretaries of departments, and the limits of their respective powers have always been a source of difficulty. Under Pierce, it seems to have been the practice to allow the secretary at least a nominal veto on all nominations to offices within his department. Lincoln was inclined at first to overlook this, and had much difficulty with Secretary Chase in regard to it. The personality of the secretary has much to do with his influence, but few of them exert very much at present, except as advisers of the President. The latter dispenses comparatively little patronage directly, but as the final arbiter in disputes between Senators and Representatives, holding in his hands the whole situation and adjusting the various interests, he has a power which makes even a weak man powerful and a strong man, party dictator. The boss exerts his influence through some of these agencies: as the friend of the President, as a member of Congress, or as the political mentor of Congressmen. The whole is now highly systematized; the Treasury Department can tell in a moment by its card catalogue how many men every Congressman has recommended, how many have been appointed, and what Congressman recommended every appointive officer.

The Spoils System and Administration.—The spoils system does not necessarily mean bad administration. Its uncertainties deter men of conservative tendencies from entering government employ; but the opportunities of sudden and distinguished advancement attract men of adventurous character, and undoubtedly so far in our history this latter class has contained the greater part of the ability of the nation. It is not to be supposed, moreover, that the whole service has ever been changed at any single proscription. William Hunter entered the State Department in 1829 and served until 1886, preserving the continuity of tradition and becoming a power in the State by reason of his experience. He is a type of a large class of permanent officials, who have on their shoulders the weight of routine business. Often it is easy to distinguish between two distinct classes of officers, the one working at government duties and the other attending to politics. Of course this double system is expensive, because of the unnecessary number employed and the fact that the class of men attracted while able are not always honest; but it need not be inefficient.

Rotation in Office.— While the rise of the spoils system is so closely connected with the rise of the new democracy, and its organization was soon completed, there are several significant episodes in its later history. The system had been justified before the public largely by the democratical phrase "rotation in office." For a long time, however, actual rotation was practised only when the incoming President belonged to a different party from his predecessor. Buchanan was the first President to expel men of his own party. It was then held that the public offices were prizes, and that democracy demanded that they be shared round as often as possible, that no one should hold longer than four years. Consistency required that a President who was re-elected, decapitate his own appointees, and this policy was urged on Lincoln in 1865. He firmly set his face against the suggestion, and it has never been carried out. Buchanan's example, however, has been followed with the single exception of when Roosevelt succeeded McKinley.

The Spoils System and the South.—The seaboard South was for a long time comparatively free from the spoils system. Jefferson stated, not quite truly, that he had no requests for removals from that region. The dislike for the New York machine did much to promote the formation of the Whig party there, and Calhoun was not more emphatic in his support of slavery than in his demand for reform in politics. This immunity was largely due to the political conditions, the fact that politics was the business of the wealthy, and that the public offices were not needed to support party organization. The Civil War and Reconstruction brought a total change. The attempt to build up a stable Republican organization composed of moneyless negroes and money-seeking white men from the North, involved necessarily the use of public offices, both State and national, as spoils. After the overthrow of the negro domination, this organization was still maintained by the use of the national spoils, because of the votes it could cast in national nominating conventions. In the Democratic party, the wealthier class gradually lost its control, and the rise of a real democracy has been again marked by the adoption of the spoils system, which may be said now to embrace the whole country.

The Spoils System and Civil Service Reform.—At the very time that the spoils system was being extended into the South, it received a

vigorous attack in the development of civil service reform. It was natural that such a movement should come when the Civil War had so greatly distended the civil service. The method of reform proposed was the substitution of a mechanical for a personal method of appointment. It was claimed by the supporters of the *status quo* that no mechanical system could be devised which could properly take into account a man's ability to perform the functions of his office. The reformers claimed that such a system was possible, that offices must be withdrawn from politics, and that this could be done only by eliminating the personal element. In 1883, after an earnest crusade, Congress voted that the experiment should be made. It has received the support of every President since that time, and has been extended until about half the offices in the national civil service have been withdrawn from politics, while many States and cities have followed the example of the national government. But the end of the spoils system is not yet. It has been seen that party organization has never demanded all the offices; and one half being taken away, it lives now on the other half. With the extension of protection to department after department, the pressure on those remaining has become greater. Partly as a result of competition and partly because of the improved tone of business in the country at large, ability and honesty have been more demanded them formerly in the open departments and their administration much improved. With this improvement the efforts of the reformers have slackened. Party organizers, on the other hand, have rallied to save what is left to them, and much further progress for the examination system seems improbable unless some substitute can be found for the offices as the payroll of party organization. Finally, it should be noted that the reform system rests very greatly on the President, and that, should he become hostile, it might be so thoroughly emasculated as to open everything to the spoilsman.

CARL RUSSELL FISH,
Professor of History, University of Wisconsin.

27. United States — Annexation of Texas to the. The Louisiana Purchase in 1803 gave the United States a shadowy claim to Texas. This claim was maintained and strengthened by each succeeding administration until 1819, when all rights beyond the river Sabine were given up as a consideration to Spain for the cession of the Floridas. Between 1820 and 1830 great numbers of Americans settled in central Texas; most of these were from the Southern States, and they had carried their slaves with them. An arbitrary union in 1824 of this semi-Anglo-Saxon region to the Spanish state of Coahuila gave rise to much dissatisfaction; the abolition of slavery throughout the newly established Mexican republic in 1829 increased the discontent of the thrifty Texan slave-holders; but when, in 1830, the Mexican government forbade citizens of the United States to settle within the discontented region and placed the country under military control, the Texans demanded (1833) complete separation from Coahuila and an independent existence in the Mexican confederation. This was refused and a still closer surveillance was established by Santa Anna in 1834. Two years later the Texans issued their declaration of independence and set up a government of their own. The fact that only two of the leaders of this movement were not American settlers is proof enough as to one cause of the conflict. Santa Anna attempted to put down the revolt; he failed disastrously. At San Jacinto, in northeastern Texas, April 1836, the insurgents defeated the Mexicans and either killed or captured their entire army. A constitution was now agreed upon and the republic of Texas firmly established. It is significant that the constitution provided expressly for the re-establishment of slavery, which had been maintained contrary to law since 1829. The boundaries of the new state were declared to be the Rio Grande on the southwest and the Sabine, Red and Arkansas rivers — the line of 1819 — on the north and northeast. These boundaries gave Texas a total area of 270,000 square miles — a territory equivalent to five of the larger States of the American Union. Gen. Sam Houston, the hero of San Jacinto, became the first President of the Texan republic. The government thus founded was in its essential features a copy of that of the United States. Texas was recognized at once by the United States as an independent nation, and the powers of Europe followed suit in a few years.

Texas made application for admission into the American Union in August 1837. President Van Buren opposed the proposition and eight States made formal protest against annexation. But as early as May 1836, one month after the battle of San Jacinto, John C. Calhoun had declared from his seat in the Senate that an independent power between the United States and Mexico was inadmissible; he favored immediate annexation, and, as he openly declared, on the ground of the extension of slavery. Calhoun represented the South, and the South since 1830 had become more firmly anchored in slavery than ever. The States of Virginia, Maryland and the Carolinas exported not less than 50,000 slaves a year to the Far South and Southwest. An active propaganda favoring annexation immediately began; legislatures of most of the slave-holding States passed resolutions calling for annexation. Even the great influence of ex-President Jackson was given to the cause. But the Whig party won the election of 1840, and the Whigs, more a Northern than a Southern party, opposed annexation. In order to "carry" the important State of Virginia, which was already States-rights and pro-annexation in political complexion, John Tyler had been placed on the ticket with Harrison. Tyler, a Whig because of Jackson's high-handed methods rather than from principle, was a States-rights devotee, a slave-holder and a determined annexationist; he became President on the decease of Harrison in April 1841. In 1842 the Texans again knocked at the door of the Union. It would have been opened to them but for the opposition of Webster, the secretary of state. Next year Webster resigned and Abel P. Upshur of Virginia was appointed to fill the vacancy. The new secretary belonged to the extreme States-rights school of politicans. The cabinet, which had been re-formed in 1842, was now in accord with the executive. Annexation became at once the main business of the administration. In October 1843 Upshur informed the Texan representative in Washington that a re-

newal of overtures for annexation would be welcome. Van Zandt asked for the requisite powers, but meanwhile the influence of the abolitionists had reached Texas and a sharp contest was waging there about the question of slavery. The pro-slavery party, both in Texas and the United States, suspected English intrigue. A speech of Lord Aberdeen's in Parliament gave some color to this suspicion. The administration inquired of the English cabinet the cause of the rumors circulating in Texas and the South and received a complete disavowal of any aim or intention on the part of the English government to interfere in any way with the affairs of the new republic. Still other influences had come into play: Texas had learned to stand alone; an armistice had been arranged with Mexico; a definite peace seemed more than probable. Houston and the other leaders of Texas had lost their former enthusiasm for annexation. The wooing was now to come from the other side. The slave States of the United States became uneasy; the vast and fertile area of Texas seemed about to be lost to their cause; failure to act promptly had been the fatal cause, and now fear of war with Mexico gave the final motive to Texas for remaining out of the Union. The outlook was not quite so dismal as it seemed; the Texans inquired of Upshur, in January 1844, whether the United States would protect them against Mexico while the proposed negotiations were pending, for it was known to all that much difficulty and delay would be put in the way of annexation by the Whig party in the United States Senate. The secretary of state did not answer this question, but his agents in Texas let it be known that protection would be guaranteed. The way was again open and negotiations now began in earnest. Upshur was killed, on 28 Feb. 1844, by the explosion of a gun on board the warship Princeton. Tyler called John C. Calhoun, the first great mover of the annexation scheme, to the office thus made vacant. Calhoun accepted the State portfolio with the single purpose of finishing the work he had begun eight years before. The treaty was speedily concluded and ratified by the representatives of both countries. On 22 April 1844 it was sent to the Senate. The issue was now clearly drawn and the country immediately divided: Calhoun, sustained by the unanimous voice of the Southern States, asked for immediate annexation; the Whigs, except its Southern wing, followed by the great majority of the North, denied the request.

Meanwhile, another issue had been preparing. For many years the vast Oregon region had been held jointly by Great Britain and the United States. This territory extended from northern Texas to the 54th parallel of north latitude. Both England and the United States had claims on Oregon, and these claims had been mutually recognized, but the people of the West, always ready for growth and expansion and not given to quibbling over constitutional limitations, were rapidly coming to demand the whole of Oregon. Calhoun saw the importance of the Oregon question; he recommended that the Democratic party couple it with the Texas question, though he did not favor the extreme demands of the Westerners. The Southern Democrats seized the opportunity, and co-operating with the expansionists of the West, they began a campaign for the control of the Democratic national convention, which was to meet in Baltimore. The editor of the Richmond *Enquirer* was a typical leader of this movement. A letter of ex-President Jackson, written a year before, was now published in the *Enquirer*, bearing date of 1844. The Nestor of the party urged annexation. When the convention met it set aside at once Jackson's favorite, and the ablest Northern candidate, Van Buren, and nominated James K. Polk, an avowed "Texas man." The platform demanded the immediate "re-annexation of Texas and the re-occupation of Oregon." "Fifty-four or fight" became the party cry of the West, while the leaders of the South boldly threatened secession in case Texas was not annexed. Meanwhile, the Senate rejected the Texas treaty by a majority of 35 to 16, and the leaders of the Whig party, aided by the dissatisfied followers of Van Buren, exerted their influence to the utmost to get the country to sustain the Senate majority. They failed by a narrow margin and Polk became the next President. Tyler and Calhoun, falling back on a popular Democratic doctrine, considered themselves and Congress "instructed" by the country to proceed with their work. Since the Senate held out stubbornly against them they resorted to the plan of accepting Texas by joint resolution, a method hardly justified by the Constitution. This required a majority only of both Houses, while the passage of a treaty in regular form required two-thirds. The joint resolution passed, and on 3 March 1845 annexation was complete, so far as the United States was concerned. Texas approved the treaty without questioning its legality in June 1845, and in July of the same year the people of the Lone Star State, in convention assembled, ratified the work of their representatives by an almost unanimous consent.

Texas came into the Union with a quarrel on its hands: Both the Mexican and Texas governments claimed the country lying between the Nueces and the Rio Grande. This and all other subjects of dispute between these governments seemed about to be amicably arranged in the early months of 1845, on condition, however, that Texas should not permit annexation to the United States. Mexico had repeatedly declared that annexation would be regarded as a declaration of war. When the joint resolution passed Congress the Mexican minister in Washington asked for his passports and the American representative in Mexico was unceremoniously dismissed. The United States had already sent troops into the disputed country; a year later they advanced under General Taylor to the Rio Grande and trained their guns on the Mexican town of Matamoras. War followed. Texas had been obtained at the behest of a Southern party and for the purpose of a make-weight against the expansion of the free States toward the Northwest. The leaders of Texas had come into the Union to safeguard slavery against the free labor and abolitionist sentiment of the great outside world. This had not been done without the promise of the "re-occupation" of Oregon, which gained the votes of the West and North. But the able, aggressive and uncompromising policy of Calhoun and his section had aroused the North; the abolitionists became politically important, and the issue which followed ter-

minated in civil war. Consult MacMaster's and Schouler's Histories; also Von Holst, 'Life of Calhoun,' and McLaughlin, 'Life of Cass.' See also TEXAS; MEXICAN WAR.

WILLIAM E. DODD,
Professor of History, Randolph-Macon College.

28. United States — The Abolition and Free Soil Movements in the. The first important and concerted movement in America for giving freedom to the slave began with the Quakers (q.v.). Their persistent opposition to human slavery arose from the nature of their doctrines. Even before the American Revolution, individual Quakers like John Woolman of Philadelphia, raised their voices in favor of emancipation. The emphasis placed upon the rights of man, in the Revolutionary struggle, also strengthened the sentiment in favor of emancipation in all the colonies. As this period drew to a close, no stronger condemnation of slavery was uttered than by Thomas Jefferson, himself a slaveholder, in his famous book called 'Notes on Virginia.' A similar arraignment of the institution was made by George Mason of Virginia, in the Constitutional Convention of 1787. About this time the Northern States were taking steps which ultimately freed them from slavery. New England and Pennsylvania led the way in this movement. The first anti-slavery society in America was formed in Philadelphia in 1780. Benjamin Franklin became one of its members. But this form of opposition was not confined to the Northern States, for both Maryland and Virginia organized anti-slavery societies. The movement in the South, however, did not reach the point of emancipation by State action. The institution of slavery had become firmly riveted on the South, because of climatic and industrial conditions, and the problem of emancipation, therefore, was vastly more difficult than at the North.

In Washington's administration a new and powerful factor was introduced into the problem by the invention of the cotton gin (q.v.). This machine so cheapened the preparation of cotton for the market that the raising of cotton became the dominant industry of the lower South. The North profited from this new era of cotton development by building cotton factories and in competing with England for the raw cotton of the slaveholding States. Both an American and European demand were placed upon the South for the extension of cotton production. The price of slaves also rose, and the domestic slave trade so increased that the supply seemed to be abundant, although, when the African slave trade was abolished in 1808, many persons had hoped that the result would be the gradual decay of slavery. But they were mistaken. The new industrial and commercial foothold obtained by the institution gave it more favor than before in the eyes of both the North and South. Only the Quakers kept up any serious attack upon it during the first 25 years under the Constitution.

Opposition to slavery had been based, thus far, on all sorts of grounds, and had been carried on in a very moderate and decorous fashion. The Quakers, although attacking the system on moral grounds, did so in a manner comporting with their reputation for moderation. The prolonged and exciting struggle over the admission of Missouri (1819–21), however, turned attention upon the slavery question in a more intense way than ever before. Benjamin Lundy, a Quaker, who had already been working to encourage slaveholders to emancipate their slaves, now founded the first important anti-slavery paper, the 'Genius of Universal Emancipation' (1821). He published editions of his paper in Ohio, Tennessee, and Maryland. In 1829 Lundy called to his aid young William Lloyd Garrison who became the most fiery and radical of all the early abolitionists. His hard-hitting blows fell upon a New England slave dealer for carrying a cargo of slaves from Baltimore to New Orleans. Garrison was soon in jail, from which he was released by a stranger paying his fine. He now returned to New England and founded in Boston (1831) the most famous of all abolition papers, 'The Liberator.' With the aid of a few friends he founded the New England Anti-slavery Society in 1832 with the avowed object of endeavoring "by all means sanctioned by law, humanity, and religion to effect the abolition of slavery in the United States." Similar organizations sprang up in other northern States, and another anti-slavery paper, the 'Emancipator,' was launched in New York city, under the patronage of Arthur Tappan, a philanthropist. These were small beginnings. Only a few men in any community were courageous enough to stem the tide of public disapproval. In 1833 a little group of men and women gathered from ten States, met in Philadelphia to establish the American Anti-slavery Society. Among them were Garrison, Samuel J. May, John G. Whittier, William Goodell, Lewis Tappan, and Lucretia Mott. In that city not a man was found willing to serve as chairman. For safety they met behind locked and guarded doors and labored at their task throughout the day without venturing to hold an evening session or to be seen on the streets in search of a mid-day lunch. A declaration of principles was issued which showed the unalterable determination of the abolitionists to carry on the agitation against slavery until every slave in America was liberated. Public sentiment was to be aroused by public speakers traveling about the country, by sermons from the pulpit, by appeals from the press wherever possible, and by a wider circulation of antislavery tracts and periodicals. Headquarters of the new society were set up in New York with Arthur Tappan as president, and with the 'Emancipator,' Goodell editor, as their organ. Immediate emancipation was their cry and uncompromising hostilities to slavery their creed. In a few years hundreds of anti-slavery societies had sprung up and more than 500,000 anti-slavery documents been distributed.

The rapid growth of the abolitionists introduced discord and faction. In a short time leaders arose who demanded that abolitionists participate in politics, as a means of forwarding the cause. Some of the old leaders, of whom Garrison was chief, strongly opposed political action, but declared in favor of woman's participation in the work of the anti-slavery societies. The differences between the two parties were augmented by the strong opposition of some northern clergymen to women taking part in public discussion. The dissensions grew till State and national organizations were disrupted, resulting in two sets of anti-slavery societies and two sets of anti-slavery publications. In 1840

a number of abolition leaders who believed the time for political action had come, met at Albany and formed the Liberty party (q.v.). Among the founders of this national party were Myron Holley, Gerrit Smith, and James G. Birney. The latter was nominated for the presidency, and renominated in 1844. In the famous campaign of 1840, he polled about 7,000 votes and in 1844, 62,000. Neither of these votes represented the total strength of the abolitionists and certainly not the strength of the anti-slavery sentiment of the country. The rapid rise of the anti-slavery societies which followed the formation of a national organization, greatly accelerated the work, begun by Garrison and the 'Liberator,' of sending abolition documents into the South. The result was a storm of indignant protests from the slaveholders who resented what they termed an interference with their own domestic institutions. They declared that the abolition literature sent among them was incendiary and intended to excite servile insurrection, the most dreaded, because the most horrible, of events. Nat Turner's rebellion (q.v.) in Virginia (1831) was then still fresh in mind. In their excitement the slaveholders made certain demands upon the people of the North. They called for the suppression of the abolitionists and their work by public opinion and by State action. Rewards were even offered for the arrest and transportation to the South of Garrison and Arthur Tappan.

Public feeling in the North was already so bitter against the abolitionists that it hardly needed the added impulse of the South's demands. On 4 July 1834, the anti-slavery celebration in New York city was broken up and the leaders compelled to escape for their lives. For nearly a week the excitement continued. All the important daily papers, except one, encouraged the populace to suppress the abolitionists. Their business places and even their houses were attacked by the infuriated mob, and the quarters occupied by the negroes were invaded and property destroyed. In nearly every Northern State the work of putting down the abolitionists went on. The rougher element was encouraged by resolutions passed by meetings of the respectable portion of the community. Fifteen hundred influential names signed a call for an anti-abolition meeting in Faneuil Hall. The great orators of Boston addressed an excited multitude. In a few days gallows were found standing in front of Garrison's home. A few weeks later at a woman's anti-slavery meeting a mob filled the streets, broke into the house to which Garrison had fled and dragged him out with a rope. He was rescued with great difficulty and was compelled to leave the city for safety. Danger threatened abolitionists in Brooklyn. Lydia Maria Child (q.v.) wrote: "I have not ventured into the city, nor does one of us dare to go to church to-day, so great is the excitement. Mr. Wright was yesterday barricading his doors and windows with strong bars and planks an inch thick." A mob led by respectable citizens of Cincinnati destroyed the printing press of 'The Philanthropist,' and attacked the houses occupied by negroes. In 1837 an Alton, Ill., mob shot down the Rev. Elijah P. Lovejoy (q.v.), the editor of an abolition paper, while he was endeavoring to protect his press. This event, and other extreme measures against the abolitionists, overshot the mark, and public opinion became more sympathetic toward the hated and hunted disciples of the abolition creed. The great majority of them — women as well as men — showed the true martyr spirit, in the era of their persecution. But the rush of events was already drawing public attention away from the abolitionists, and turning it toward other phases of the anti-slavery conflict.

The Quakers had begun in Washington's administration to petition Congress against the slave-trade. Later their petition struck at slavery in the District of Columbia. The abolitionists joined in the work of petitioning against slavery in the District. As early as 1831 John Quincy Adams, then a congressman, presented 15 such petitions, but declared that he did not approve of their object. From year to year these petitions had been received and referred to the committee on the District of Columbia, and nothing more came of them. But in 1835 Hammond of South Carolina moved that an anti-slavery petition be not received. To some, this motion seemed necessary to check the rising tide of abolition petitions, but to others, the remedy seemed worse than the disease, for it attacked the ancient right of petition. An exciting debate arose running throughout an entire day. Adams now came forward as the champion of the right of the petition and Slade of Vermont made a fiery speech declaring war upon the institution of slavery. This speech greatly angered the slaveholders and their supporters. In 1836, the debate over abolition petitions was renewed and continued for four months during which many thousands of persons put their names to petitions. The result was a resolution of the House to lay all papers relating to slavery on the table and to take no further action on them. This was the germ of the famous "gag" rule. But this action only stirred anti-slavery people and by 1838 petitions to Congress against slavery had increased tenfold. Early in 1840 the House made answer to these by establishing the following standing rule: "That no petition . . . or other paper, praying the abolition of slavery in the District of Columbia, or any State or Territory, or the slave-trade between the States or Territories of the United States in which it now exists, shall be received by this House or entertained in any way whatever." Similar, though more temperate debates were going on in the Senate and similar results followed.

The attempts to suppress the abolitionists' agitation both in and out of Congress by attacking ancient popular rights very naturally produced a reaction in their favor and against the cause of slavery. The battle for the right of petition was waged, therefore, with untiring energy by John Quincy Adams, Joshua R. Giddings and others. The threats made to expel them from Congress and the denunciation heaped upon them only aided them in the end by bringing to their aid an increasing number of congressmen, and in 1844 victory crowned their efforts; the gag rule was repealed.

Additional meaning was given to the questions of freedom of the press and the right of petition by the demands of the slaveholders that all anti-slavery documents be excluded from the United States mails. Some of the inhabitants of Charleston, S. C., broke into the post-office (1835) seized a quantity of abolition literature and burned it in the presence of spectators. The

postmaster-general gave it as his opinion that although such documents could not lawfully be excluded from the mails, the postmasters owed a higher duty to their communities than to the laws. President Jackson, in a message to Congress, severely criticised the work of the abolitionists and recommended that Congress prohibit under severe penalties, the circulation of such documents through the mails. Congress not only did not accept the President's recommendation, but instead passed a law providing for fining and imprisoning postmasters for withholding mail from the persons to whom it was addressed. On none of the points of contention had the opponents of the abolitionists been able to score a permanent victory. On the contrary the permanent results were against slavery. Among them may be enumerated the rapid increase of anti-slavery, if not abolition, sentiment, and the formation of a political party. Another result was the feeling of many northern men, who had little or no sympathy with the agitators that the friends of slavery were demanding too great a sacrifice of cherished principles for its protection. One of the most deplorable results of 10 years of bitter agitation was the ill will engendered between the radical elements of the two sections. Neither could do right in the eyes of the other. The danger lay in the fact that other events might cause the spread of this sentiment to the steady minded classes of the two sections. Such events were already on the horizon.

The South came to feel that safety to slavery, and to the social and industrial fabric based upon it, lay in preserving the equilibrium between the sections in the Senate. That equilibrium had been hopelessly lost in the House of Representatives, and to preserve it in the Senate required the addition of new territory to the United States. To accomplish this end, the annexation of Texas quickly followed the Texan revolution, and the cession of California and New Mexico came as a consequence of war with Mexico. But it was far more difficult to determine slavery's relation to the new territory than it had been to win the territory by war. The South gave an indication of its coming attitude by defeating Van Buren for renomination in 1844, because he had opposed the immediate annexation of Texas. Northern anti-slavery men followed by defeating Henry Clay in New York by voting for a candidate of their own, because Clay, after opposing immediate annexation, had written a letter trying to explain the matter to the satisfaction of Southern Whigs. In 1846, President Polk asked Congress to vote a sum of money to assist him in making peace with Mexico. David Wilmot, a Pennsylvania Democrat, offered an amendment to the appropriation bill, providing that in any territory obtained from Mexico, slavery should never exist. This amendment is the famous Wilmot Proviso (q.v.). Twice it passed the House, but each time failed to get through the Senate. Southern leaders were stirred to combat more vigorously the idea that Congress could exclude slavery from the Territories. Northern men affirmed more vehemently the right of Congress in this matter, because, to admit the South's contention would invalidate the anti-slavery features of the Ordinance of 1787 and the Compromise of 1820. The debates in Congress and the discussions by pulpit and press began to shake men's allegiance to the old parties. Therefore, the Whig party, the majority of whose votes was generally in the North, nominated for President (1848) General Zachary Taylor, a Louisiana slaveholder, but refused to commit itself on the slavery question. The Democratic party, whose main strength lay in the South, nominated Lewis Cass of Michigan, and likewise uttered no decisive word on the vital question. This noncommittal attitude of the leaders of the old parties angered anti-slavery men of all parties who promptly coalesced and launched the Free Soil party at Buffalo, N. Y. (1848). The platform contained 19 resolutions mainly relating to slavery, and declaring in favor of "Free Soil, Free Speech, Free Labor, and Free Men." It also declared that Congress had, and ought to exercise, the power to exclude slavery from the Territories, but that it possessed no authority to interfere with slavery in the States where it already existed. Although this platform did not satisfy the extreme abolitionists, it offered a line of defense, on constitutional grounds, which appealed to moderate reformers who could not sympathize with the Anti-Union sentiment of Garrison and his radical followers. The slaveholders were right in believing that the underlying cause and the logical consequences of the Free Soilers and the abolitionists were not greatly different. The Free Soilers nominated Martin Van Buren for President and Charles Francis Adams for vice-president. The Van Buren Democrats in New York, nicknamed the "Barnburners," supported the new party. The result was a nominal Free Soil vote of over 290,000, the loss of New York by Cass, and the triumph of General Taylor. The Van Buren supporters were avenged by the defeat of Cass, and most of them returned to this allegiance.

During the next four years the Free Soil idea gained at the North, but the party made but little progress. The Compromise of 1850, and the consequent effort to discourage all agitation as dangerous to the perpetuity of the Union, discouraged any great gain by the party. Both the old parties in their nominating conventions (1854) pledged themselves to stand by the Compromise, and Hale, the Free Soil candidate only polled 156,000. The passage of the Kansas-Nebraska Bill (q.v.) (1854), suddenly precipitated the anti-slavery conflict in a more virulent form than ever before. The result was the break-up of the Whig party. Thousands of its Southern supporters joined the Democratic party (q.v.), while the majority of its Northern voters cooperated with other anti-slavery elements in forming a new party, the Republican. Although the organization of the Free Soil party was thus disbanded, its principle became the rallying cry of the Republican party (q.v.). See also SLAVERY.

W. H. MACE,
Professor of History, Syracuse University.

29. United States — Mexican War. Owing to its close association with the slavery controversy the Mexican war has been the subject of almost endless dispute. Many people believed at the time, and many others still believe, that it was forced on by a Democratic administration in order to secure more territory in the southwest for the extension of slavery. It would be difficult either to prove or to disprove this view conclusively. The immediate cause of the war was the

annexation of Texas. The Democratic platform of 1844 favored annexation, but at the same time it was equally explicit in asserting the American claim to Oregon, a territory which could not by any possibility be opened to slavery. To the party leaders this connection of the two questions may have been only a shrewd bit of politics, but President Polk's determination to fight for 54° 40′ showed that it meant much more than that to him. The success of the ticket also indicated that it meant more to the American people. The constant cry of a slaveholders' conspiracy would not blind them to the advantages of acquiring so much valuable territory. At the time of the annexation, Texas (q.v.) had been an independent republic for nine years, recognized as such by the leading nations of the world. Although the Mexican government had made no serious attempt during that interval to reassert its rights, it now notified the United States that anexation would be regarded as a *casus belli*. The passage of the joint resolution of 1 March 1845, was, in consequence, followed by the recall of the Mexican minister at Washington, and the formal suspension of diplomatic relations.

In addition to the Texan question there was a long-standing controversy in regard to the claims of American citizens against the Mexican government. During the numerous revolutions which had occurred since Mexico gained her independence Americans had often suffered imprisonment and loss of property. A claims convention of 1839 provided for a board of commissioners to pass upon these cases. There was some delay, however, in making the payments, and a second convention was concluded in 1843, in which Mexico agreed to pay all claims within five years in quarterly installments. A few payments were made, but in 1845 they had again fallen very much in arrears.

In October 1845, President Polk informed the Mexican secretary of state that he wished to settle the questions in dispute amicably, and that he was ready to send an envoy with full power to act. The secretary made an evasive reply in regard to the subjects to be discussed, but expressed a willingness to receive our representative. The president at once commissioned John Slidell, of Louisiana, as envoy, and he set out for his new post in November. The war fever was so strong in Mexico when Slidell arrived that President Herrera was forced to refuse him an audience. A revolution, which occurred a few days later, resulted in bringing General Paredes, the head of the war party, into power. Being again refused recognition, Slidell returned to the United States in March, 1846.

If annexation and the spoliation claims had been the only questions involved, the war might still have been averted. But a controversy arose in regard to the western boundary of Texas. The congress of Texas in 1836 asserted that the boundaries of the republic extended to the Rio Grande. Historically the claim to the territory between the Nueces and the Rio Grande was of doubtful legality, but owing to internal difficulties the Mexican government had taken no steps to assert their authority. Texas was admitted into the union with "the territory properly included within and rightfully belonging" to it, but subject to the adjustment by the United States government of all questions of boundary that might arise with other governments. If the Mexican authorities had received Slidell this question might properly have come up for discussion. Their refusal left but one course open to the president, namely to treat the Nueces–Rio Grande tract as American territory. The revenue laws were extended to it, and Corpus Christi, a town west of the Nueces, was made a port of entry. The Mexican authorities resented this intrusion, and a large force of men under General Ampudia were stationed on the south bank of the Rio Grande, preparatory to an invasion of the disputed territory. To oppose him, General Zacharary Taylor with about 2,000 men was ordered to advance to the north bank of the river, opposite Matamoros. On 12 April, Ampudia warned Taylor to withdraw beyond the Nueces within twenty-four hours or take the consequences. The warning being disregarded, General Arista, Ampudia's successor, sent notice on the 24th that hostilities were commenced. On the same day a considerable force of Mexicans crossed the river a few miles above Matamoros and defeated a detachment of United States dragoons.

The news of this engagement reached Washington early in May, and on the 11th President Polk sent a special war message to congress. After speaking of the failure of the Slidell mission and explaining the movements of General Taylor, he went on to say that war already existed, that it existed by the act of Mexico itself, and, consequently that it was the duty of the American people to vindicate the honor, the rights, and the interests of their country (see MEXICAN WAR). The whole question hinged upon the ownership of the Nueces–Rio Grande strip. According to the president this district belonged to the United States, and the war was therefore defensive in its origin. On the other hand, if the Mexican claims to the strip were valid, Polk exceeded his constitutional powers in beginning an offensive war without the consent of congress. However, the president's position was safe enough because congress had already recognized the country beyond the Nueces as American territory, by including it within the revenue system, and the senate had ratified the appointment of a revenue officer. Two days after the message was received an act was passed providing for the vigorous prosecution of the war.

Whether or not the war was defensive in origin, it was certainly not long conducted on that basis. After his successes at Palo Alto, 8 May, and at Resaca de la Palma, 9 May, Taylor crossed the Rio Grande and captured Matamoros on the 18th, before he could possibly have heard of the congressional act of the 13th. The president's military orders showed clearly his intention to seize Mexican territory. General Kearney was authorized to occupy New Mexico, Commodore Sloat to take possession of Upper California, and Taylor to prosecute the war in Mexico. These orders were faithfully executed. Kearney captured Santa Fé and brought all of New Mexico under subjection. Frémont and Commodore Stockton, who had succeeded Sloat, were equally successful in California. Taylor made his way slowly into the interior. In September, after defeating an army under Ampudia, he captured Monterey.

The anti-slavery Whigs in congress pointed to these facts as evidence that the war was not being waged to protect the honor of the United States, but purely in order to seize the territory of a weaker power. Among the discontented was Abraham Lincoln, who was elected to congress in 1846. Jefferson Davis approved of the war and resigned his seat in congress to lead a Mississippi regiment. In general the conflict was popular in the South and unpopular in the North, the strongest opposition being in New England. Lowell's keen satires in the 'Biglow Papers' represent well the sentiment of that section of the country. See LOWELL, JAMES RUSSELL.

In spite of adverse criticisms, President Polk never once swerved from his original line of action. Early in 1847 a second army was sent out under General Winfield Scott to land at Vera Cruz, and to attack the capital from the east. The series of Mexican disasters at the beginning of the war had resulted in another revolution which restored Santa Anna to power. His plan was to meet Taylor first, defeat him, and then return to the city of Mexico in time to defend it against Scott. The battle of Buena Vista was fought 23 February 1847. Taylor's force of 5,000 men won a victory over an army four times as large. Immediately after the battle Santa Anna hurried south to meet General Scott. The two armies first came into conflict at the mountain pass of Cerro Gordo, and the Americans were again successful. This was followed by the victories of Contreras, San Antonio, and Cherubusco. The way was now open to the City of Mexico, but the arrival of a peace commissioner from the United States led to the conclusion of an armistice. See MEXICAN WAR.

The scene now shifts to Washington. President Polk had been confident of success from the very beginning of the war. As early as 8 August 1846 he asked Congress for $2,000,000 to be used in negotiating a peace. This was far more than enough to meet the ordinary expenses of peace commissioners. The object of the President, however, was perfectly clear; in fact, he made no attempt to conceal it. Mexico was to be called upon to cede New Mexico and California. A bill was introduced into the House of Representatives to appropriate the amount required. David Wilmot, a Pennsylvania Democrat, moved the insertion of a proviso to the effect that neither slavery nor involuntary servitude should exist in any territory to be acquired by the war. (See WILMOT PROVISO.) It was passed by the House in 1846 and again in 1847, but was defeated by the Senate on both occasions. The House finally yielded, and the appropriation, increased to $3,000,000, was made without the proviso.

Nicholas P. Trist, of Virginia, was at once sent to Mexico as a peace commissioner. He was authorized to demand the cession of New Mexico and Upper California and the recognition of the Rio Grande boundary. This was the minimum to be accepted. In order to obtain these terms, he was to begin with an additional demand for Lower California and for the right of way across the Isthmus of Tehuantepec. At the proper moment he might surrender these points and also offer a money consideration. The Mexican authorities refused the terms, negotiations were broken off, and General Scott renewed his campaign. On 13 September he stormed the heights of Chapultepec, and on the following day entered the City of Mexico. The enemy were now compelled to accept whatever terms were offered to them. Negotiations were reopened with Trist, and the treaty of Guadalupe Hidalgo was signed 2 Feb. 1848. It was sent to the Senate 23 February, ratified by them with amendments 10 March, and the final ratifications were exchanged 30 May. In return for $15,000,000 and the assumption by the United States of the spoliation claims of their citizens, estimated at $3,250,000 more, Mexico ceded California and New Mexico, and recognized the Rio Grande frontier. Mexicans living in the ceded territory were to be free to continue to reside there or to remove to Mexico, without any prejudice to their property. Those who remained could either retain the title and rights of Mexican citizens or become citizens of the United States.

The immediate result of the war, then, was the acquisition of the vast territory comprising the present States and Territories of California, Nevada, Utah, Arizona north of the Gila, and parts of Wyoming, Colorado, and New Mexico. More than half a million square miles of valuable land were transferred from a non-progressive nation to a nation that was able to develop its resources. The enormous mineral deposits of that region were just beginning to be developed. And even now, over half a century after the peace, the agricultural industry, owing to the tardy extension of irrigation facilities, is still in its infancy. Many of the best people in the country in 1848 were so blinded by the slavery issue that they could not realize the value of their conquest. Fortunately for our history, such men as Cass and Douglas had sufficient influence partially to allay the prejudices of their section and thus to secure the ratification of the treaty.

But, although the anti-slavery sentiment was not strong enough to embarrass the government in the conduct of the war or to endanger the treaty of peace, still it could not entirely be kept in the background. That was shown, for example, in the struggle over the Wilmot Proviso. As soon as peace was concluded and it was no longer necessary to keep up the appearance of unanimity before the enemy, the controversy was renewed. Three questions came up for solution: Should California be admitted as a free State? Should the remainder of the territory acquired from Mexico be organized in accordance with the Wilmot Proviso? What should be the boundary between Texas and New Mexico? These questions and others connected with slavery were nominally settled by the compromise of 1850, but the controversy was soon renewed in a more violent form, and culminated in secession, civil war, and emancipation. See MEXICAN WAR, THE; TEXAS.

Consult: Burgess, 'Middle Period'; Schouler, 'History of the United States'; United States Statutes at Large (IX., 9–10); House and Senate Journals (29th and 30th Congresses); Congressional Globe; Senate and House Executive Documents; Richardson, 'Messages and Papers of the Presidents.'

W. ROY SMITH,
Associate in History, Bryn Mawr College.

30. United States — Slavery in. When the English colonies were first established in America, chattel slavery of white people had nearly died out in Christian Europe, although serfdom to the owner of the estate to which one was attached still prevailed in Russia, Germany, and many other parts of Europe. In England, the only recognized chattels were the rare negroes or Asiatics owned as a matter of pride by a few wealthy men. In the new world, however, the English colonists adopted the Spanish habit of enslaving such of the native Indians as they could possess themselves of; but the tribesmen were sullen, insubordinate, and short lived. Though as late as 1692 an Indian woman, Tituba, was the first of the Salem witches, the slavery of that race was never of any economic importance.

Nevertheless part of the white population in all the English colonies was in a condition not far different from serfdom: until some time after the American Revolution, there was a distinct class of so-called "indented" or "indentured" white servants, both men and women, who served their masters for a term of years, sometimes for life, and were almost completely subject to his will.

One element of this class was convicts. The early planters begged for "offenders condemned to die out of common gaols." By 1650 grew up a regular practice of "transporting" some criminals instead of hanging them, and it is estimated that first and last 50,000 convicts came over. For instance, a Scotchman was sold as a slave for life to America for the heinous offense of burning the Bible; and in 1736 Mr. Henry Justice of the Middle Temple stole books and in consequence was transported to America, "there to remain seven years, and to be put to death if he returned, etc.," and one Sarah Wilson, servant to a maid-of-honor to the Queen, was landed in Maryland, put up for sale and purchased. Another fruitful source of indented servants was the political prisoners. After the battle of Worcester in 1650, about 1,000 Scotchmen were ordered sent to the colonies. In 1716 a lot of Jacobites were sent over. By far the larger and more important class of white serfs was that of the "redemptioners," who agreed with some shipmaster to carry them over and in America to sell their services for a term of years to any purchaser for a sum sufficient to pay their passage money. Thus, in 1774, John Harrower, whose diary has been preserved, "was obliged to engage to go to Virginia for four years as a schoolmaster for bed, board, washing, and five pounds during the whole time." He was duly sold to a Virginia gentleman, and lived a respectable and honest life. Many such servants on expiration of their time, set up for themselves and founded families. Many of them ran away from their masters and were advertised, pursued, arrested, whipped, and branded exactly like slaves.

By far the most important phase of American servitude was the slavery of the African negroes; it was directly related to the centuries of war between the Mohammedans and the Christians in Europe, which engendered a deep seated belief that Christianity forbade the slavery of Christians, but allowed the enslavement of infidels. In 1517 Las Casas, a benevolent Spanish divine, suggested that negroes be imported into the West Indies from Africa, to save the remnants of the unhappy Indians. The African slave trade at once sprang up to the Spanish and Portuguese possessions, and by 1670 the English adventurers, especially Sir John Hawkins, began to engage in this profitable business. The first English continental colony to buy negro slaves was Virginia, where, in 1619 a Dutch ship of war sold some in exchange for provisions; but it was in the English West Indies, especially the sugar growing islands of Barbadoes, Tobago and Jamaica that slavery first found a profitable field. To these islands were sent most of the white convict slaves, and the continent received for its supply of slaves only those already seasoned in the West Indies.

Though so early established, negro slavery was of very little importance on the continent during the 17th century. The total number of negroes in all the colonies in 1700 probably not being more than a tenth of the whole population. The 18th century saw, however, a lively slave trade, and widely distributed slaves. For supplying these laborers, there grew up a direct traffic from Africa to the North American colonies, in colonial vessels, chiefly owned in New England and in New York. Newport and Bristol, R. I., were noted centres of the trade.

The result was that negroes were distributed more or less throughout all the colonies, although their condition, employment, and treatment was very different from community to community. Excepting on Narragansett Bay and the Hudson River, where there were plantations with large numbers of slaves, the negro in the northern colonies was chiefly a house servant, and the institution was here at the best; the old North Church in Boston still contains a slave gallery for such people. Negroes probably were no worse treated than indentured servants or apprentices of the time, and were often much valued and respected by their masters. Well-to-do free negroes had a vote, though nearly two-thirds of the white men were deprived of the suffrage.

Proceeding southward, in Pennsylvania the number of negroes was large, and in Maryland, Virginia, the Carolinas, and Georgia, it was an established part of the social and economic system. The cruelties of the institution were most manifest in the scattered plantations of the Carolinas, in which the slaves considerably outnumbered the white people. There about 1780 Saint-John Crèvecœur found a negro servant exposed in a cage, left there to be devoured alive by insects and by birds, which had already destroyed his eyes; his unpardonable offense was killing a white man.

The steady growth of slavery is remarkable because it was actually prohibited by two of the New England colonies. Massachusetts in the Body of Liberties in 1641, drawn up by Rev. John Cotton declared that, "There shall never be any bond slaverie, villinage or captivitie amongst up unles it be lawfull captives taken in just warres, and such strangers as willingly sell themselves or are sold to us." And Rhode Island in 1652 "ordered that no black mankind, or white . . . serve any man or his assigns longer than ten years." These acts were a dead letter; slaves were born, grew up, died, and left the taint to their posterity in every Northern community, as well as in the South.

Indeed, there was in every community a body of positive legislation on terms of transfer of slave property, and on special offences of slaves and of white people toward slaves, so that the institution of slave property was as firmly rooted and as widely disseminated as that of private property in land. This is the more striking, because in England even the enslaving of blackamoors was thought inconsistent with human rights. In the celebrated case of James Somersett, in 1772, Lord Mansfield gave a decision that slavery was "so odious that nothing could be suffered to support it but positive law"; there being no such law in England, he therefore refused to compel Somersett, whom his master had brought to England, to remain in the custody of that master.

Long before slavery had acquired such a firm and important status, it had been attacked by philanthropic men. In 1624, John Usselinx objected to slavery in the proposed Swedish colonies. Georgia was founded in 1732, as an anti-slavery colony, but the restriction was given up in 1749. The first Englishman to protest against colonial slavery was Roger Williams in 1637, and John Eliot in 1675 declared that "to sell soules for mony seemeth to me a dangerous merchandize." Richard Baxter, favorite English Puritan author of devotional books, said in 1673, "To go as Pirates and catch up poor Negros or people of another Land, that never forfeited Life or Liberty, and to make them slaves, and sell them, is one of the worst kinds of Thievery in the World." Samuel Sewall, in his tract 'The Selling of Joseph,' says: "Originally and Naturally, there is no such thing as Slavery, because all Men, as they are the sons of Adam, are Coheirs; and have equal Right unto Liberty, and all other outward Comforts of Life."

The most efficient agency against colonial slavery was the disapproval of the Quakers, both north and south. The German Quakers of Germantown in 1688 adopted a minute against the traffic in negro slaves, to the effect that though they were black, there was still no more liberty to have them as slaves than there was to have white ones. The organization of the Quakers in local meetings gave them an opportunity to develop an opposition to human slavery which was inherent in their attempt to embody the Golden Rule in their own lives; hence there sprang up Quaker agitators, of whom Anthony Benezet and John Woolman were the most famous. John Woolman has left a delightful journal, edited by Whittier, full of the quaint records of his laborious journeys to testify against the evils of human slavery. Furthermore many Quaker meetings passed minutes disapproving of slavery, and eventually disfellowshipping members who insisted on holding them. They did much to raise the standard of treatment of slaves and caused the liberation of very considerable numbers.

By the time of the Revolution then, both slavery and anti-slavery were firmly established in the English colonies. The slave trade continued steadily; and outside the Quakers and a few other reformers, there was little protest against it on moral grounds. Yet efforts were made to restrict it in some of the colonies; in the Northern, because they wished to raise a revenue from it; in South Carolina because they feared slave insurrections. Whatever the reason, all such colonial acts were regularly vetoed by the governor, or disallowed by the home government, on the ground that a trade so profitable to British merchants must not be diminished.

The main objection to slavery before the American Revolution was that it was contrary to Christianity; indeed for many years the planters objected to the efforts to evangelize their slaves, on the ground that a baptized slave might claim freedom as a Christian. Yet planters had their slaves, kept them, worked them, if they felt like it killed them with overwork, and ignored the philanthropists.

The Revolution added a second argument of immense weight, namely, the rights of man. It is perfectly true that the framers of the Declaration of Independence, when they said that "all men are created equal" had in mind men who were sharers in the government; but some negroes had the requisite property qualifications and were voters in states both North and South. Still when the Revolutionary patriots so vehemently declared that they never would be slaves they could hardly have forgotten that about one sixth of the community were actual slaves. The progress of the Revolution emphasized this contradiction, for large numbers of negroes were enlisted in the Continental Army, especially in the Northern states, where they seem sometimes to have served in regiments indiscriminately with white men. Rhode Island was obliged to promise freedom to slaves who joined the army, and to liberate their families; and a dangerous rift was thus made in the system of slavery.

This rift was widened by the action of several states during and immediately after the Revolution. In 1775, an abolition society was formed in Pennsylvania under the presidency of Benjamin Franklin, and similar societies followed in the New England States. These organizations at once began to petition legislatures to secure better treatment for slaves, and even to prohibit slavery altogether. The movement rapidly gained headway in the Northern communities where slaves were few and vested property interests were small.

In 1777, the people of Vermont drew up a state constitution containing clauses "that all men are born free and independent," and that hence slaves should be set free at the age of majority. The next community to act was Pennsylvania, where under strong pressure from the abolitionists, 1 March 1780, an act was passed declaring that all persons thenceforward born within the state should be set free at 28, thus putting slavery in process of extinction. Still more effective was the action of Massachusetts which, in 1780, adopted a new constitution, drafted by John Adams, the opponent of slavery; the bill of rights included the declaration "that all men are born free and equal, and have certain natural, essential, and inalienable rights, among which may be reckoned the right of enjoying and defending their lives." In 1783, in a test case, the Supreme Judicial Court held that under this clause there was no such thing as slavery in Massachusetts. The precedent thus set was followed by New Hampshire in 1783, in a constitution similar to that of Massachusetts; and by gradual emancipation acts in Rhode Island and Connecticut in 1784. For a time the tide was stayed till in 1799, New York,

and in 1804, New Jersey, passed gradual emancipation acts. Thus, of the sixteen communities admitted to the Union before 1800, eight became free.

Meantime the national government had also taken important and far-reaching steps in regard to slavery. The First Continental Congress, to damage English trade, drew up the Association of 1774, in which the colonists agreed not to import slaves; and this prohibition was maintained throughout the Revolution. Most of the states passed laws prohibiting the slave trade, so that when the Revolution was over, there appear to have been no importations.

The opposition of the Northern States to slavery was quickly reflected in Congress, where from 1775 to 1777 there were hot disputes on the question of assessing federal taxes; the Northern States insisting that slaves ought to be counted either as a part of the population, or a part of the wealth of the South; the South insisting that slaves were not as productive as free men and that they ought not to be reckoned at their full number. Upon the more serious question of territorial slavery the Confederation Congress took radical ground, for it became necessary to provide a government for the immense areas added to the United States both north and south of the Ohio River. In 1784 Jefferson reported an ordinance which included a clause that in all the new territories, "after the year 1800 of the Christian æra there shall be neither slavery nor involuntary servitude." For lack of one vote in one State this clause was rejected; but in 1787, in the Northwest Ordinance, Congress applied to the Northwest Territory the prohibition which had failed three years before. Hence, when the Constitutional Convention of 1787 adjourned, slavery was prohibited in the whole section of the country north of Maryland (except New York and New Jersey), by action of the States; and from the Pennsylvania line westward to the Mississippi, by Congress.

When the Federal Convention assembled at Philadelphia in May 1787 it speedily became evident that slavery, or rather the division of the Union into a free and a slaveholding section, was an obstacle to the work. Following the suggestion of Mr. Madison, that it was "wrong to admit in the Constitution the idea of property in men," the Convention scrupulously avoided using the words slave and slavery in the final document, but five clauses in the final draft distinctly refer to that institution.

1. The apportionment of direct taxes "shall be determined by adding to the whole number of free persons . . . three fifths of all other persons." This clause was the result of a long and bitter controversy; as Gerry of Massachusetts put it, "why should blacks who are property in the South, be in the rule of representation more than cattle and horses in the North?"; while Pinckney of South Carolina thought that in apportionment "the blacks ought to stand on an equality with the whites."

2. "The migration or importation of such persons as any States now existing shall think proper to admit, shall not be prohibited by the Congress," prior to 1808. This clause of course relates to the slave trade, complete control over which was for a time withheld from Congress; and the concession to the Northern States was part of a bargain by which they retained the right to pass navigation acts.

3. A clause relating to fugitives provided for the return of any person "held to service or labor in one State, under the laws thereof, escaping into another."

4. "The citizens of each State shall be entitled to the privileges and immunities of the citizens in the several States,"—a clause afterward applied to, or claimed for, negroes.

5. "Congress shall have power to dispose of and make all needful rules and regulations respecting territory or other property belonging to the United States." This was the power under which the Northwest Ordinance of 1787 had prohibited slavery.

The experiment was now fairly under way of carrying on a federal government with three different principles as regarded human slavery,—freedom in the northern colonies; slavery in the southern; and a discretionary power over territorial slavery in the Federal Government. The difficulties of this situation were clearly shown when, in 1790, the abolition societies petitioned Congress to regulate the slave trade; and the House of Representatives passed resolutions in which they expressly disavowed any power to regulate slavery within the States. Three years later Congress exercised its power over fugitive slaves by passing an act which provided that under the authority of the United States and on the certificate of any magistrate, a master or his agent might personally apprehend a slave escaped into a free State.

In 1789 Congress exercised its power to deal with slavery in the territories by re-enacting the ordinance of 1787; but in 1798, on the organization of Mississippi Territory, the anti-slavery clause was omitted, and slavery was allowed to continue there. In 1801 the United States took over the District of Columbia and reaffirmed the pre-existing laws of Maryland, including harsh slave codes. In 1827 the opponents of slavery in the District of Columbia memorialized Congress to prohibit slavery in the District.

A long-continued agitation in England against the slave trade resulted in an act against it in 1806. This example was helpful in the United States which by the act of 7 March 1807, laid an absolute prohibition on the foreign slave trade.

In 1821, on the final admission of Missouri, Congress insisted that a clause in the State Constitution prohibiting the incoming of free negroes should be withdrawn, because contrary to the citizenship clause.

In the forty years from 1790 to 1830 the conditions of slavery radically changed. In 1790 the census showed 700,000 slaves; in 1830 there were 2,000,000, in each case about one third of the total population of the slave-holding communities; but slavery in 1790 was dying out from want of profitable employment. When Eli Whitney invented the cotton gin for separating the seed from the fibre (1794) a profitable crop was opened up. The product of cotton in 1800 was 210,526 bales, in 1830 1,038,847 bales. It is a crop requiring cultivation during a considerable part of the year and adapted to rude labor in large gangs; it thus made slave labor profitable along the Gulf, and furnished a market for the surplus slave population of the border slave States; hence all sections of the South had an economic interest in its continuance.

Looking at slavery from the side of the slave, the conditions varied extremely; in general the work was lighter and the relations with the master more humane in the border slave States where cotton was little grown, and farming was more diversified. The great cotton, rice, and sugar plantations of the far south made heavier demands upon the slave; and the plantations were often managed by hired overseers. The condition varied also according to the character, intelligence, and temper of the masters; easy-going, kind-hearted, genuinely religious masters and mistresses often felt a strong personal responsibility for their slaves; but it was part of the system of slavery that passionate, coarse, and overbearing men and women might own slaves and frequently treated them with harshness, severity, or extreme cruelty.

The condition of the slave varied also according to his employment. Most of them were field hands, engaged in the rudest and most toilsome labor; but some were employed as roustabouts on the river steamers, as longshoremen, and some as carpenters, blacksmiths, masons, plasterers, and the like. The number of slaves thus used in small gangs was not significant; and a much greater number were busy as household servants, there being practically no other domestic service obtainable in the South; people, therefore, who needed such services and had no slave, hired one.

Almost always the handsomest, most intelligent, and most promising slaves were used for household service, and it was a highly prized privilege, bringing better food, abundance of cast-off clothing, and personal relations with the white people.

The field slaves worked long hours, commonly from sunrise to sunset, and were kept up to their work by white overseers, and on large plantations also by negro slave drivers armed with the whip. Men and women, and half-grown boys and girls were engaged in this field labor. Their houses were cabins in the negro quarters, usually small, dark, and dirty, but often as good as the ordinary house of the poor white. The clothing of the field hand was rough, coarse, and scanty. Thrifty planters estimated that it cost about $15 a year, on an average, to feed and clothe a slave.

Most adult slaves were married, but family relations were so disturbed by sale and a feeling of irresponsibility, that such relations were very changeable. The slaves usually had Sunday free and a few days of jollification at Christmas; in many places they also had their own churches with a rude and boisterous worship, conducted by slave preachers.

One of the incidents or accompaniments of slavery much in the minds of people at that time, was sale. Negroes who, in the colonial days, could be bought as low as $50, by 1830 were worth $500; and by 1860 prime cotton hands were quoted as high as $1,500. The South, in 1860, valued its slave property at about $2,000,000,000. Of course this high value depended upon the opportunity to market surplus slaves and to buy hands as needed; hence, a lively system of picking up slaves at private sale, gathering them up into coffles or gangs and shipping them south by land or river, there to be sold out again. Though the slave trader was universally despised by the white people, the kindest master might get into debt and have to sell his slaves, or his death might cause his property to be divided. Auction sales were very frequent and abounded in most pathetic incidents of the division of families.

Another frequent incident was escape. Slaves were always running away and taking refuge in swamps or forests; many of them returned, took their flogging, and went to work again; many others became fugitives, and made their way northward; and thousands of them remained there or passed on farther north to Canada. These fugitives were commonly the most determined and ablest of their race, and by stealing themselves they depreciated slave property, especially in the border States.

A third incident was manumission,— from early Colonial days slaves were set free by indulgent masters during their life or by their wills; and the free negroes in the South in 1860 were about one sixteenth of the whole number. The process of setting slaves free was commonly hedged about by two restrictions: (1) The master must give bonds that the freedman should not become a public charge; (2) in some States he was obliged to remove him from the commonwealth in which he was set free.

A fourth incident was insurrection. Beside several risings in Colonial days, of which the New York Slave Plot of 1741 is the best known, there were three insurrections or attempted insurrections in the 19th century: the Gabriel insurrection in Virginia (1800); the Denmark-Vesey in Charleston (1822); and the Nat Turner rising in Virginia in 1831, in which 70 white people were massacred. This was the last of such movements; even during the Civil War there was no slave rising in the South, but the fear of it was a constant motive in the minds of the Southern people.

Looking at the institution of slavery from the point of view of the master, the southern community was divided into three strata of white people: (1) The large slave holders. In 1850 about 2,000 families owned as many as 100 slaves each; the largest number under one management was about 2,500. These 2,000 families made up the social and political aristocracy of the South, furnished a great number of the professional men, and almost all the holders of high political offices, State or national, in the South. (2) The small slave-holders, about 350,000 families: of these, in 1850, about 60,000 held only one slave. Such people commonly had a poor living, in rough houses with unsavory food, and few opportunities for their children; with them were associated a considerable body of non-slaveholding farmers.

(3) At the bottom of society was the great class of poor whites, including the mountaineers; they held no slaves, but owned their own land and lived upon it in a miserable fashion. They were a naturally intelligent people, but extremely ignorant and made up about three fourths of the white population. They implicitly followed the political leadership of the great planters, and were perfectly persuaded that the cause of slavery was their own, although they were looked down upon by well-to-do white men, and were sometimes despised by slaves.

The system of slavery was maintained by a rigorous code of special laws. Property and mortgage rights in slaves were protected by

law. The masters were assured the physical control of slaves by laws and customs which gave them authority to compel obedience and force labor; and to resist any real or supposed belligerency of the negro by force, which commonly took the form of whipping. The laws held a master responsible for killing a negro, unless in defence of his life; but negro testimony could not be received against a white man, and the law of a State which absolved the master in case a slave was so inconsiderate as to die under a "moderate" chastisement, sufficiently indicates public sentiment on the necessity of giving discretion to the master in all doubtful cases.

Assemblages of slaves, and any sort of riotous behavior were dealt with by special acts. In many States, special tribunals of the slaveholders in the neighborhood took testimony in a summary fashion, and executed punishment, even to the taking of life. There were also special laws against the consorting of whites with negroes, or their purchase of property from slaves. Runaways were stopped by a system of patrols, a kind of voluntary mounted police, who scoured the roads and picked up suspected characters.

Such was the system of slavery, a system of brute force, supported by a powerfully welded public opinion and backed up by a body of positive law. On many plantations the life of a slave was easy enough, labor was light and he was looked on as a reasoning being; on other plantations he was treated worse than the beast of the field, because he could talk and was held to the responsibility of men. Slave labor was notoriously inefficient and wasteful; and small planters made very little out of their slaves. The larger planters, by working out a kind of machine system, had better results; but it was at the expense and the degradation of their white neighbors as well as of the slaves.

The opposition to slavery which had been widespread in 1787, grew less and less, as the years went on, though till 1830 there was a national anti-slavery organization, which held a convention about once in two years, usually in a border state city. The system of slavery grew more and more deeply rooted, and when the Northern abolitionists began, in 1831, an active crusade against it, the Southern societies disappeared and only a handful of Southern men could be found who would so much as make a public argument against the desirability of slavery.

From being an "evil" which must be destroyed, by 1820 the South as a community were thinking of it as an evil which could not be removed without destroying the country; by 1830 they grew to advocate it as something which, whether evil or not, must neither be attacked nor discussed; thence it was an easy step to advocate it as desirable in itself, as Calhoun put it, "a good, a positive good"; and in the last stage of the contest, just before the Civil War, Southern leaders like Jefferson Davis insisted that slavery must be extended in some degree to the Northern States.

The abolition movement is elsewhere discussed,— our object at this point is to show how slavery, so strongly buttressed in the interests and the pride of the South, yet quickly came to an end. As has already been shown, when the two sections had clearly adopted opposing systems of labor, many questions of choice between the two systems came before the federal government. It was in vain to urge that slavery was a State institution existing only under State laws, in the face of the fact that Congress, by its regulation of the slave trade in the District of Columbia, of international relations, of fugitives, and of the Territories, had a power to increase or to diminish the slave power. In fact, the national government furnished the arena in which the question must finally be fought out.

The first great step came about 1835, when the abolitionists, in part encouraged by the English acts abolishing slavery in the West Indies (1830-5), sent petitions to Congress asking for the prohibition of slavery in the District of Columbia. The South was able to influence enough Northern votes to secure a succession of gag resolutions, intended to prevent discussion in Congress; but the question sprang up in many unexpected ways. The apparently innocent power of carrying mails by the federal government brought to light the objections to the delivery of abolition mail at the Southern post-offices. The Southern leaders attempted to stop the rising tide of discussion of slavery in Congress; but John Quincy Adams arose as the champion of free speech, and he was speedily aided by other men like Joshua R. Giddings of Ohio, who would not be silenced.

By 1842 it was plain that slavery might be discussed throughout the North and in Washington; soon it had to be discussed, because of new questions of territorial slavery. The principle of dividing the Union by a geographical line had been continued by the compromise of 1820, which prohibited slavery north of 36° 30′ (excepting in Missouri). In 1845 Texas was brought into the Union with the express purpose of furnishing material for a body of slave-holding States; yet again Congress prohibited slavery in Texas, north of 36° 30′.

Then followed, in 1848, the annexation of New Mexico and California, with the plain expectation that the 36° 30′ line would be produced to the Pacific. The North, however, was aroused and the people of California refused either to divide their commonwealth or to admit slavery within its borders. By the compromise of 1850, California was acknowledged free, and New Mexico and Utah were practically left as fighting ground for slave power; yet Congress, in 1848, passed a fourth act prohibiting territorial slavery, this time in Oregon. In the same compromise of 1850, Congress passed a new fugitive slave law and prohibited slavery in the District of Columbia.

The contest was raised again by the Kansas-Nebraska Act of 1854, which repealed the Missouri Compromise and, by implication, the three other acts prohibiting slavery in the territories; and left Kansas to be controlled by the first set of people who might get on the ground. Contrary to expectation, the first set were from the North, and the determination of the Southern settlers in Missouri and of the South generally, to take possession of Kansas in spite of the will of the majority of the settlers, occasioned a civil war in Kansas, six years before the greater national Civil War.

By this time it became evident that slavery

was a political question which divided the nation; and in 1856 the first large and widespread anti-slavery party was formed. The Dred Scott Decision of 1857 was an attempt to suppress the controversy, and to take it out of politics, by denying the right of Congress to prohibit slavery in a territory, though that right had four times been exercised, with little opposition. From this time the drift was steadily and irresistibly toward Civil War,—and the crisis was reached in 1860, when the Southern Democracy demanded, as a condition of remaining in the Union, their right to share in all territory thereafter annexed, and to have an end of abolition agitation in the North.

Although in a resolution of 22 July 1861, the House of Representatives declared that slavery was not the cause of the war nor the freeing of the slaves its purpose, from the beginning it was plain that slavery was the great question which divided the two sections, and that consequently its future was inextricably woven into that struggle. Hence, the war had hardly begun before there came a series of special enactments and executive proclamations. (1) On 26 April 1862 an act of Congress freed the slaves in the District of Columbia, with a compensation of about $300 a head. (2) On 19 June 1862 an act, in flat defiance of the Dred Scott Decision, prohibited slavery in every Territory. (3) On 2 July 1862 an act was passed providing that slaves of persons engaged in rebellion against the United States thereby gained their freedom. President Lincoln was all the while turning over in his mind a larger scheme, and on 22 Sept. 1862 he issued a preliminary proclamation, followed on 1 Jan. 1863 by a final proclamation, of emancipation, by which all slaves within the Federal lines were declared free, excepting in the State of Tennessee.

To the national prohibitions of slavery in the Territories, the District of Columbia, and the seceded slave States were added the actions of three slave-holding communities; West Virginia, by its Constitution (21 March 1862), Missouri by a vote in convention, 1 July 1863, and Maryland by constitution (13 Oct. 1864), declared for absolute or gradual emancipation. They thus joined the cohort of freedom, so that at the end of the war, the only regions within the boundaries of the United States in which slavery remained legal were Delaware, Kentucky, and Tennessee, the last of which States declared for freedom by a new Constitution in 1865.

But although slavery was practically at an end, under the then accepted theory of the Constitution, both Congress and the States might legally re-establish it; and to prevent that contingency and wipe out the last vestige of the system, the Thirteenth Amendment was introduced into Congress, received the necessary two thirds vote (22 Feb. 1865) and 18 Dec. 1865 it was announced that the necessary three fourths of the States had ratified it, and that to the text of the Constitution had been added the significant words, "Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction."

As Lincoln said a few days before his death, "We have finished the job." Beginning in 1775 with a United States in which slavery was the normal condition of every community and every square mile of vacant territory, the struggle of 90 years ended with a condition in which by the firmest of constitutional enactments, the normal status was everywhere that of freedom. The amendment even reached out into the future, and covers all annexations made or that can ever be made; so that chattel slavery of human beings, no matter what their color, is now absolutely unknown to the law of the United States or of any State, Territory, or dependency.

ALBERT BUSHNELL HART,
Professor of History, Harvard University.

31. United States — Finances of the (1816–1861). In 1816, at the close of the war with England, the chief problem before the government was the restoration of the currency to a specie basis. Dallas, upon assuming the office of secretary of the treasury in 1814, vigorously endeavored to secure a charter for a second United States Bank through which pressure might be exercised upon the local banks to resume specie payments. The Republican party as a whole had long opposed a bank founded upon a federal charter; and notwithstanding Dallas' support, promptly advanced constitutional objections. The discussion ran through two years in which several plans were proposed; the principal points of difference were, first, whether the capital of the bank should be based upon treasury notes or upon government stock; second, whether the bank should be forced to loan money to the government; and third, whether the bank should be given power to suspend specie payments. The bank was chartered in March 1816. Its capital was based in large part upon government stock; the government in addition subscribed to the stock and had representation in its management. The bank was obliged to transfer the public funds free of charge, and was made the depository of government moneys. As a return for the exclusive privilege of a national charter, the bank paid to the government a bonus of $1,500,000. The establishment of this institution was quickly followed by a congressional resolve that after 20 Feb. 1817, all dues to the government should be paid only in specie, treasury notes, notes of the Bank of the United States, or in notes of local banks which were payable on demand in the foregoing currency. This decisive action forced the State institutions to adopt sounder methods, and on the date named there was general resumption.

In 1816 the revenue system was reorganized, not for lack of revenue, but because the enormous volume of imports rushing into the country upon the return of peace, endangered domestic manufactures which had been abnormally stimulated during the war. The value of imports in 1816 was estimated at $116,000,000 as compared with $13,000,000 in 1814. Customs duties amounted to $36,000,000, far surpassing the previous estimate of Dallas of $13,000,000. Even President Madison affirmed the necessity of protection. A new tariff bill was consequently enacted 27 April 1816; in particular the cotton industry received protection. In December 1817, the internal revenue duties were repealed; and in the following year supplementary customs duties were placed upon iron commodities, thus establishing the policy of protection. In these measures the South cordially joined, and Calhoun, who afterward bitterly op-

posed the high tariff policy, at this time supported higher duties.

During 1816 and 1817 the treasury was in a most favorable condition; revenue exceeded all expectation, yielding surpluses amounting in two years to nearly $30,000,000. Good fortune, however, did not continue; the new United States Bank was mismanaged and the currency was once more thrown into disorder. This, together with an extraordinary commercial and manufacturing expansion, led to a crisis in 1819. The revenues were severely affected and customs duties which yielded $26,000,000 in 1817 fell back to $13,000,000 in 1821. In 1820 and 1821 the treasury budget showed a deficit. Expenditures for the navy and pensions were reduced; and a change in the management of the bank, with a contraction in its circulation and loans, led to a revival of business and improving revenues. Beginning with 1822 the treasury annually enjoyed a surplus (except in 1824 when a large payment was made on account of Spanish claims) which was applied to the reduction of the debt. In 1820 an attempt was made to increase tariff duties, partly to help the revenues at that time embarrassed, and partly in behalf of protection. The bill passed the House but failed in the Senate by one vote. Clay and John Quincy Adams championed protection and liberal expenditures for internal improvements, cardinal points in the "American System." The effort was renewed in 1824 and protection was sought in particular for iron, wool, hemp, glass and lead, industries of the middle west. The contest now assumed a sectional division; the Middle, Western and Southwestern States being arrayed against New England and the South. New England's chief interest at this time was in commerce, and her leading representative, Webster, made an exhaustive argument in behalf of freedom of trade. The measure became law by a vote of 107 to 92; in the South there was but one vote in favor to 47 against. During the next 10 years the tariff question occupied a large place in congressional debate and legislation. The tariff of 1824 fell short of the demand of woolen manufacturers, and agitation for a revision with still higher rates resulted in the tariff of 1828. New England was turning more and more to protection, and Webster under instructions made a speech declaring that through the encouragement of the Act of 1824 capital had been invested which needed further protection. The woolen tariff, or Tariff of Abominations as the measure was frequently termed, aroused the fiercest controversy, which finally led to nullification and the compromise tariff of 1833. By this latter act a horizontal reduction of duties, spreading over a number of years, was made and for a while the tariff question yielded in importance to other political issues.

A persistent attack upon the United States Bank, resulting in its downfall as a federal institution, began in 1829. President Jackson in his first annual message in 1829 raised the question of constitutionality, and doubted the value of the Bank in establishing a sound currency. In its place he suggested an institution more directly under the management of the treasury department with power to receive both public and private deposits, but with no right to make loans. Jackson undoubtedly voiced the conviction of western democracy, that the affairs of the government should be divorced from private corporate undertakings. The suggestion had little immediate influence, for both branches of Congress made reports in favor of the Bank. In 1831 Senator Benton took up the fight against the Bank, resting his argument upon the evils of all kinds of bank notes, and in particular attacked the issue of branch drafts. In 1832 the Bank petitioned for a new charter and was successful in carrying its bill through Congress. Jackson interposed a veto, laying stress upon the evil of a money monopoly. He did not stop here but next determined on the removal of the government funds from the custody of the Bank; in this he was encouraged by his re-election in 1832 which he interpreted as a popular endorsement of his opposition to the Bank. There were doubts, however, as to the legality of removal of the public moneys without the sanction of Congress. W. J. Duane who was appointed secretary of the treasury in June 1833, refused to take the responsibility, and although Taney the attorney-general supported Jackson's contention, Duane remained obstinate. He was forced from office and was succeeded by Taney who on 26 September, issued an order directing the deposit of public moneys henceforth in certain local banks. These institutions, popularly known as Jackson's "pets," were chosen with care, and by the Act of 23 June 1836, the regulation of public funds was strictly prescribed so as to safeguard the interests of the government in every possible way.

In 1835 the public debt was paid off; customs receipts had steadily increased; and beginning with 1830 there was an enormous expansion in revenue from sales of public land. In 1834 and 1835 the annual receipts from this source alone were nearly $15,000,000 and in 1836, $25,000,000. A new fiscal problem of dealing with a surplus was thus created; many schemes were projected, chief among which was Clay's proposition that revenue from lands be distributed among the several States. Any plan to prevent a surplus by lowering customs was negatived on the ground that the tariff question has been, for the time being at least, settled by the Act of 1833 and ought not to be reopened. On the other hand, there was objection to the distribution of the proceeds of land sales on the ground that public lands had been ceded for paying off the Revolutionary debt; that this national income could not in fairness be given to States which had not originally shared in the gift, and that the Constitution required all revenues to be appropriated for specific objects. Others desired to make large expenditures for internal improvements, fortifications, or education. It was impossible to pass a distribution bill, but the same end was reached by the Act of 23 June 1836, providing for the deposit of certain surplus funds in the treasury, amounting to $37,000,000, with the several States in proportion to their respective representation in Congress. In law this was a deposit which could be recalled, but it was practically regarded as a gift to the States. The deposits were to be made in four quarterly installments during the year 1837. Before the deposit was completed, the country was involved in a commercial panic which made it impossible for the government to pay the fourth installment.

On 1 July 1836, the treasury department issued an order known as the Specie Circular, requiring all land agents to accept only specie in

payment for public lands; as local bank notes had been previously received, and specie was scarce in the West where sales were made, speculative operations based upon land were sharply checked. Eastern banking institutions with western connections were obliged to contract their loans, and this, coupled with a heavy transfer of funds, in accordance with the deposit act, proved a severer strain than many banks could stand. The evils were aggravated by commercial failures in Europe, decreasing crops, and southern speculation in cotton. In May 1837, the banks throughout the country suspended specie payments, and as the treasury had parted with its funds, it shared in the distress and was also forced to suspend. During the next few years treasury notes were issued amounting to $47,000,000 of which one third were reissues; and between 1841 and 1843 there were three long-term loans. With the exception of 1839, there was a series of annual deficits until 1844.

The failure of the banks to protect the funds of the government led President Van Buren to recommend the establishment of an independent treasury system by which the government might take care of its own funds. A prolonged dispute within the party over the details of this plan, as well as the opposition of Whigs who wished to establish another United States Bank, deferred the passage of the independent treasury act until 1840. In 1841 the Whigs gained the election and used their power by repealing the treasury law. Owing to the vacillating opposition of Tyler who succeeded President Harrison, it proved impossible to pass constructive legislation, and for lack of other agencies, the public funds were once more placed with local banks; this practice continued until 1846. Whig success also led to a revision of the tariff in the Act of 1842 along protectionist lines. Additional reason for higher duties was found in the embarassment of the treasury and the need of increased revenue. In 1846 the Democrats regained the presidency and at once re-established the independent treasury system and enacted a new tariff. The treasury act of 1846 provided for the custody of public funds at mints, custom houses, and at sub-treasuries in a few of the larger cities. It also provided that all public dues should be made either in specie or treasury notes, thus excluding bank notes. The system in its main features has remained unchanged to the present time, and it has been successful in safeguarding the funds of the government.

The tariff of 1846 was a free trade tariff; specific duties were abolished; and the duties were so rated as to yield the largest amount of revenue. Commercial enterprise was again at a high level; railroad construction and foreign immigration contributed to new industrial development; and in spite of the temporary interruption occasioned by the war with Mexico, the treasury entered upon another long period of prosperity. Customs receipts were large; the sales from public lands again proved fruitful; and repeated surpluses made it possible to reduce the debt, until in 1857 it stood at $28,800,000. In 1857 another reduction in tariff rates was made to which all sections of the country gave generous support. Railroad construction, however, had been carried too far and capital for the moment was unprofitably tied up in unproductive investment. Bank note circulation was unduly expanded, and a panic occurred in August 1857. The treasury with weakened resources fell into embarrassment and was obliged to issue treasury notes to meet its obligations. In the years 1858–60, the deficits amounted to $50,000,000.

During the period 1816–61, the United States became a commercial nation, necessitating new methods of customs administration. The regulations affecting the appraisement of goods were made more strict. Credits to importers were abolished, and in its place a system of warehousing was established. Among the later secretaries of the treasury, Walker and Guthrie stand out pre-eminent, the first for his notable report in which he recommended the tariff of 1846, and the second for his development of administrative details. See also UNITED STATES — FINANCES OF THE (1861–1903).

DAVIS RICH DEWEY,
Massachusetts Institute of Technology.

32. United States — Efforts to Settle the Slavery Question in the. In all cooperative efforts of the North and South to settle disputes over slavery the preservation of both slavery and the Union were objects of primary consideration. The roots of such efforts are found in the compromises of the Constitutional Convention of 1787. The most important agreements then made, provided that (1) three fifths of the slaves should be counted in determining the number of congressmen a State should have and the amount of direct taxes it should pay and that (2) the African slave trade should continue for 20 years. These compromises are significant partly because the "more perfect union" could probably not have been formed without them and partly because the "Fathers" thus gave the stamp of approval to compromising disputes over slavery, for the sake of the Union. By the aid of the three fifths advantage the South, in 1790, had but three less congressmen than the North. But each succeeding census showed a constantly growing majority in the North's favor so that by 1820, this majority amounted to 43. But the South had already begun to look for the protection of her interests in the preservation of an equilibrium in the United States Senate, where population is not so directly represented.

Of the original 13 States seven were northern and six southern. During the administrations of Washington and Adams, Vermont, Kentucky, and Tennessee were admitted and established an equilibrium between the two sections in the Senate. The admission of Ohio (1802) and Louisiana (1812) preserved this situation. The addition of Indiana (1816), Mississippi (1817), Illinois (1818), and Alabama (1819) still kept up the balance. But the application of Missouri for permission to form a State Constitution in 1819 threatened to break the plan of alternate admissions. Besides, slavery seemed to be making a flank movement into territory which might be looked upon as geographically belonging to the North, since nearly the entire eastern line of Missouri faced the free State of Illinois. The South's need of Missouri was indeed great, for but two more possible slave States remained to be carved out of Territories. Congressman Talmadge of New York introduced an amendment to the bill permitting Missouri to form a constitution, which precipitated the first great quarrel over slavery between the two sections,

and which threatened the existence of the Union. This amendment called the "Missouri Limitation," provided that no more slaves should be taken into Missouri and that slave children born within the State should be free at 25 years of age. The House of Representatives passed the amended bill, after warm debates, but the Senate struck out the amendment and then passed the bill. The House refused to accept the change and the measure was lost for the time being. In the next session the contest was renewed, but was given a new turn by the Senate linking the bill for the admission of Maine, which the House had already passed, to the bill authorizing the people of Missouri to form a State Constitution. The Senate passed this bill with the proviso that slavery should be prohibited in the territory north of 36° 30′, but twice the House rejected the bill in this form. A committee of both houses, however, agreed upon the following compromise: (1) The separation and passage of the Maine and Missouri bills; (2) The prohibition of slavery in the remainder of the territory of the Louisiana Purchase north of 36° 30′. Both houses accepted the compromise and President Monroe signed the bill (1820).

But the quarrel which the people hoped had been settled was suddenly renewed in a more violent way than before. The constitution presented by Missouri to Congress looked toward the exclusion of both mulattoes and free negroes from the State. The fiery debates, the resolutions from State legislatures on both sides of the question which had already been presented to Congress, and the widespread discussion in the newspapers, led patriotic men to fear a dissolution of the Union. Therefore, Henry Clay at once took the lead in trying to settle the new dispute. Although the House rejected the report of the committee of 13, Clay did not give up, but by his persuasive eloquence, and by personal appeals to members, he finally induced the House to pass a bill to admit Missouri as a State on the condition that her legislature give a pledge that the State would never pass a law excluding the citizens of any other State. Missouri gave the pledge and was admitted (1821). Three important consequences followed from the Missouri contest: (1) The conviction that danger to the Union could force a compromise; (2) That Congress accepted the South's contention against placing unusual restrictions upon a State as it enters the Union; (3) That Congress had the power to prohibit slavery in the Territories. The remote effect of thus devoting the northern part of the Louisiana Purchase to free labor was far reaching.

The second conflict over slavery which seriously menaced the Union had reference to territory obtained by the Mexican War (q.v.). Anti-slavery men sought to exclude slavery from such territory by the Wilmot Proviso (q.v.) while pro-slavery men attempted to secure their interests by an extension of the Missouri Compromise line to the Pacific. Both of these efforts failed, but the discussions in and out of Congress deepened sectional feeling. Excitement was further increased by events in California. The discovery of gold on the Sacramento (1848) drew a large, hardy, but reckless population from all quarters. The disorder which resulted, made organized government an immediate necessity, but a bill to establish territorial government for that region failed. California did not wait long on Congress, but called a Constitutional Convention whose delegates voted unanimously for a constitution prohibiting slavery. The people of California ratified the constitution by an overwhelming majority. Thus circumstances, beyond the control of either party to the contest, placed California beyond the reach of slavery. In the meantime the State of Texas seemed to be preparing to enforce her claims to a large portion of what is now New Mexico. Anti-slavery men opposed the demand of Texas because it was expected that New Mexico would follow the example of California. President Taylor recommended Congress to admit California immediately as a State and expressed the opinion that the people of New Mexico would soon follow the example of California (1849). The radical pro-slavery men were grievously disappointed over this attitude of President Taylor and strongly favored first putting California and New Mexico through the experience of territorial government. Such a plan would have given slave holders time to move into those territories. Slavery had not yet learned that in the race for population it could not compete with freedom. The irritation of the two sections was now so great that men again feared for the safety of the Union. Although Henry Clay had retired from public life to spend his few declining years, the legislature of Kentucky without a dissenting vote re-elected him to his old place in the Senate hoping that the spell of his presence and the power of his eloquence might once more restore harmony between the sections. In January 1850, Clay introduced his most famous compromise bill. The following were its main features: (1) That California be admitted as a free State; (2) That the Territories of New Mexico and Utah be organized and that the question of slavery be left for their people to settle; (3) That Texas be paid $10,000,000 to satisfy her claims against New Mexico; (4) That the slave trade be abolished in the District of Columbia; (5) That a more efficient fugitive slave law be passed. The debates over these measures continued into September, and brought out the most splendid array of oratorical talent ever seen in the Senate. Stimulated by his last great effort for the Union, Clay seemed to gather new vigor, was unremitting in his labors, and frequently spoke with his old time power. When he rose to make his great speech, a vast concourse which filled even the avenues to the Senate, greeted him with tremendous enthusiasm, and hung in breathless silence upon his words. When he had finished, women crowded to imprint on his wan cheek the kiss of admiration and approval. His effort kindled afresh the fire of patriotism.

The hand of death was also upon the mighty Calhoun. He was only able to sit in his place and listen to another read his last speech. The burden of his address may be summed up in three propositions: (1) The restoration of the equilibrium between the North and the South by an equal division of the territory and by an amendment to the Constitution in order to guarantee the equilibrium; (2) A new law for the return of fugitive slaves, and the cessation of anti-slavery agitation; (3) The peaceful secession of the slave States from the Union, if the above propositions are rejected. Calhoun was asking for an impossible Union and an

impossible secession. The other member of the great trio, Daniel Webster, had been silent thus far, and no man, probably, knew what he would say, least of all his New England supporters. On 7 March Webster addressed the Senate in a speech "For the Constitution and the Union." He made an appeal for conciliation, and condemned agitation whether by Northern or Southern men. But he seemed to lay the greater blame for the distracted state of public opinion upon anti-slavery men. For this unexpected position they roundly denounced Webster, and his popularity in the North began to wane. Clay and Webster were of the past and had spoken for the past. But the men of the future were in the Senate also: Seward, Chase, Douglas, and Davis. There was less of compromise in these men. Seward, in particular, aroused criticism by declaring in favor of a "higher law" than the Constitution, in dealing with the slavery question. Davis demanded the extension of the compromise line of 1820 to the Pacific. In spite of the efforts of Clay and his supporters, Congress refused to accept the bill as a whole. But after Taylor's death, President Fillmore gave his influence in favor of the various parts of the bill, for, although no majority could be found for the measures as one bill, Congress gave majorities to the separate parts.

The people of the country seemed ready to accept the main features of the agreement and special efforts were made to impress upon the people the necessity and fairness of the result. Union meetings were held at which Whigs and Democrats vied with each other in praising the compromise as a final and fair adjustment of the slavery question. Although these efforts seemed somewhat artificial, the result was a lull in agitation. The two old parties in 1852, in national conventions pledged themselves to stand by the Compromise. Pierce was overwhelmingly elected President and was known to be a warm supporter of the Compromise. With these happy omens, politicians began to speak of a "second era of good feeling." One feature of the Compromise, however, threatened to disturb the promised peace. The provisions of the law for the rendition of the fugitive slaves were exasperatingly severe. The fugitive was denied the right to testify in his own behalf and was refused the use of the writ of habeas corpus. Any citizen could be summoned to aid in capturing and returning the fugitive and could be fined and imprisoned for aiding him to escape. Slaveholders, who had lost many slaves through the operation of the Underground Railroad (q.v.), put the new law into vigorous operation. One result was a number of "rescue mobs." The most famous were the rescue of the slave Shadrach in Boston by a crowd of his own color, and the rescue of the slave Jerry in Syracuse, by citizens led by Gerrit Smith and Samuel J. May. If the execution of the fugitive slave law failed to renew the controversy with its old time bitterness the introduction of the Kansas-Nebraska Bill (q.v.) (1854) by Stephen A. Douglas, senator from Illinois, more than accomplished this result. This measure was intended to settle the slavery question by turning it over to the people of the Territories of Kansas and Nebraska to determine for themselves whether they would have slavery or not. This bill involved the repeal of the Missouri Compromise and was amended so as to specify that fact. The reason given was that the compromise of 1820 was not in harmony with that part of the Compromise of 1850 which left the question of slavery to the people of New Mexico and Utah. A flame of resentment spread over the North. Since the South had not demanded the measure, it appeared that Douglas was gratuitously presenting to slavery what had heretofore been regarded as free soil, and that, too, by the repeal of a compromise venerated on account of its age. In spite of intense opposition in Congress and the fierce denunciations heaped upon the measure by pulpit and press, it became a law and compromise was at an end. Douglas lost in popularity at the North. He was burned in effigy in many places, and was even howled down in his own city of Chicago while trying to justify his conduct. The race for Kansas began before the bill became a law, and soon free State settlers and slave State settlers were struggling for its control. (See KANSAS.) Two territorial governments, two delegates to Congress, two constitutions, and armed collisions followed in rapid succession. It was necessary to call in Federal troops to preserve order in Kansas. The doctrine of popular sovereignty had failed in application. The Whig party was dead and in its stead a powerful anti-slavery party, the Republican, had arisen. Even the Democrats who remained loyal to the party were divided on the question whether a fair test of popular sovereignty had been made or not. Douglas and his followers in the North declared that the pro-slavery constitution of Kansas had not been fairly ratified by the people of Kansas. President Buchanan and his supporters asserted that the test was fair and that Kansas should be admitted as a slave State.

While the contest over Kansas was raging and threatening to involve the country in war, an entirely new method of solving the problem was tried. It was planned to take slavery completely out of politics by means of a Supreme Court decision. The case of Dred Scott (q.v.) offered the opportunity. Dred Scott had sued for his freedom on the ground that having resided in a free State he could not be held in slavery on return to a slave State. The decision contained two points of historical importance. The first denied that the negro was entitled to the natural rights enumerated in the Declaration of Independence and the second asserted that neither Congress nor the Territorial legislature could prohibit slavery in the Territories. The South rejoiced over the decision, but public sentiment at the North refused to accept its conclusion because it not only refused to the negro his natural rights as a man, but in effect asserted that Douglas' doctrine of Popular Sovereignty and the Republican free soil principles were opposed to the Constitution. Instead of taking slavery out of politics, this decision drove the question in so deep that the country was hastened rapidly toward the crisis.

The Lincoln-Douglas joint debates (1858) so widened the breach between northern and southern Democrats that the national convention of the party in Charleston in 1860 witnessed its complete disruption. The southern delegates utterly repudiated Douglas and popular sovereignty, the only man and the only principle on which the northern wing of the party could

conduct a campaign with any show of success. Four parties were in the field and the Republicans with Lincoln, won. During the fall and winter following, seven Southern States seceded from the Union. They had done what had been threatened for several years. The North had not believed the threats and was alarmed at the result. The Union of the Fathers was in danger of annihilation. "What could be done to save it?" was a question asked by thousands of persons. Nothing decisive could be done. An old administration and a timid President were passing out. The new President and an untried administration had not yet assumed responsibility. In such a period how naturally men turned to compromises in order to insure the return of the seceded States and to prevent others from withdrawing.

President Buchanan in his message to Congress declared that concessions to the South were the only means of saving the Union. Both houses entered on the work of conciliation by carefully appointing committees. The Senate's committee of 13 was made up of six Republicans and six Democrats. A seventh member was the venerable John J. Crittenden of Kentucky, a non-partisan. The House committee of 33 was made up in the same careful way. The Senate committee soon fell into hopeless disagreement and accomplished nothing. The House committee worked under great disadvantages. Two southern members refused to serve, and after the events at Fort Sumter others left the committee. More than 40 propositions and plans were submitted. Some were wise and some were foolish. Some proposed that no changes be made in either the laws or in the Constitution respecting slavery. Others proposed changes which involved the reconstruction of the very foundations of the government. The report of the committee, however, recommended a number of far-reaching concessions: (1) The repeal of all Personal Liberty Bills by which States had hindered the execution of the fugitive slave law; (2) An amendment to the Constitution prohibiting future amendments, interfering with slavery, which were not proposed by slave States; (3) Immediate admission of New Mexico as a slave State; (4) The trial of fugitive slaves in the States from which they escaped. No less than seven minority reports from members of the committee were presented to the House. The report was finally adopted, after fruitless discussion, but too late to check the tide of secession. It probably convinced the Border Slave States that they were safe within the Union. The impression made by the southern members on the Border State men was not so favorable, particularly because they refused to accept the simple statement "that peaceful acquiescence in the election of a President, constitutionally accomplished, was the paramount duty of every good citizen." The House modified and passed the amendment so that no future amendment might be made granting Congress power to interfere with the domestic institutions of any State. The Senate accepted the amendment by the requisite two thirds vote. Eight Republican senators voted in its favor. But two States ratified it, Ohio and Maryland, one free State and one slave State. The most famous advocate of compromise was the venerable Senator John J. Crittenden of Kentucky, the successor of Henry Clay. Although the Committee of Thirteen accomplished but little, Crittenden presented to the Senate a series of six amendments to the Constitution: (1) That in all the Territories north of 36° 30′ slavery should be prohibited, in those south of that line slavery should be protected; (2) That Congress shall have no power to abolish slavery in places where Congress has jurisdiction; (3) That Congress shall have no power to abolish slavery in the District of Columbia or prevent Federal officers from taking their slaves into the District; (5) That the United States shall indemnify slaveholders for loss of slaves through failure of officers caused by violence or intimidation; (6) That no future amendment shall destroy the preceding amendments or give Congress power to interfere with slavery in any State whose laws permit slavery. Petitions from all parts of the North prayed for the acceptation of the Crittenden Compromise. Although petitions came in from the South, and although the compromise was almost entirely in the interest of slavery, it was defeated by six southern senators refusing to vote. Three days after this defeat, the legislature of Virginia invited the other States to send commissioners to Washington to "adjust the present unhappy controversies . . . so as to afford to the people of the slaveholding States adequate guarantees for the security of their rights." All the States sent commissioners except five free and eight slave States. Ex-President John Tyler was elected chairman. From 4 to 27 February the "Peace Convention" as it was called, discussed propositions for conciliation. It finally recommended to Congress the amendment of the Constitution very much after the plan of Senator Crittenden. But the Confederacy was already organized. Federal forts had been seized, and Lincoln's administration was about to enter upon its duties. The situation had moved beyond the point of Compromise. Men were no longer willing to follow in the footsteps of the "Fathers," and Congress gave little or no heed to the work of the Peace Congress. See UNITED STATES — SLAVERY IN THE.

W. H. MACE,
Professor of History, Syracuse University.

33. United States — Causes of the Civil War in the. The Civil War was the culmination of the development of conflicting interests and feelings between the slave and the free States. Slavery in colonial days, aided by favoring physical conditions, obtained a deeper hold in the South than it did in the North. The invention of the cotton gin increased that hold in many ways, and hastened the growth of industrial and social differences between the two sets of States. The North, with its free labor, was able to respond to the industrial revolution which found its origin in certain great mechanical inventions, including the application of steam as a motive power, the manufacture of iron, and the use of coal as fuel. Northern industry became rapidly diversified and northern population grew with great rapidity and built up great centres of production. The South, with its slave labor, did not, or could not, take advantage of the new industrial forces, but pursued the older, and quieter ways of plantation life. Her occupations did not increase greatly in number or change in character and her population remained, as formerly, largely agricul-

tural. The meaning of two such contrasting industrial and social conditions was not clearly seen at first. It took the tariff policy from 1816 to 1828 to show that these contrasting interests were becoming conflicting interests. The adoption of a distinctly protective policy caused commercial New England to enter upon an era of manufacturing, although her capital had been largely in the carrying trade. This same policy, after 8 or 10 years, convinced Southern leaders that their hopes of the South's profiting by the tariff were doomed to disappointment. Hence, in defense of their section and the interests built upon its system of slave labor, these leaders generally united in opposition to the tariff. But how could the South successfully oppose protection while in a minority in the House of Representatives and while not able to carry Kentucky, Louisiana, and possibly other slave States against the tariff?

Southern leaders soon began to pronounce the tariff unconstitutional, but as neither Congress nor the Supreme Court had so held, this sort of opposition was not very successful. But John C. Calhoun of South Carolina went further and declared that according to the Kentucky and Virginia Resolutions, the final appeal of the slave States should be to the right of nullification by which, according to his view, any sovereign State might refuse to obey any law of Congress which the State deemed unconstitutional. The principles of the Kentucky and the Virginia Resolutions (q.v.) had been again and again asserted by the New England States during the War of 1812. James Madison, the author of the Virginia Resolutions, denied Calhoun's interpretation of them, and the other slave States refused to follow South Carolina into nullification in 1833. They did, however, accept more and more the States Rights view of the Constitution, as a means of shielding their peculiar interests. Every additional conflict between the two sections only intensified the South's view of this political doctrine, and in the end stood to the seceding States as the constitutional justification of secession. With little exception, during this same period, the North was moving just as certainly further and further from the views of the Hartford Convention and more and more toward the nationalistic view of the Constitution. The doctrines asserted by Webster and Hayne in the great debate were typical of the position of the two sections. The two sections, therefore, were not only developing interests more or less antagonistic, but were developing views of the Constitution best suited to the defense of their respective interests.

During Andrew Jackson's administration the consciousness of hostile sectional interests was deepened by other events besides the tariff controversy. Again and again in the 'South Carolina Exposition,' and in other papers intended to prepare the way for nullification, Calhoun set forth the idea of permanent industrial and social differences between the two sections. The attack by the abolitionists upon slavery as morally wrong, and the reply of the slaveholders in demanding the suppression of anti-slavery agitation, by denying the right of petition on the question of slavery, greatly strengthened the idea that the two sections possessed contrasting and conflicting interests. The natural consequence was the rise of antagonistic feeling between the slave and free States. The growth of hostile feeling went rapidly forward during the contests over the annexation of Texas and over the Mexican War. Southern leaders declared that the acquisition of new territory for slavery was necessary to preserve the balance of power in the Senate and give fresh soil and a wider area for slavery. The anti-slavery men declared that, for these very reasons, no such territory should be acquired. Both parties began to threaten the Union. In 1844 the Legislature of Massachusetts passed a resolution, introduced by Charles Francis Adams, which referred to the Constitution as a "compact" and asserted that annexation was an undelegated power to which Massachusetts would not submit. Southern declarations of dissolving the Union, if slavery should be excluded from the Territories, were even more emphatic.

The year 1844 witnessed another event which revealed the widening difference between the two sections. After an exciting contest over slavery the Methodist Episcopal Church split into a northern and southern branch. This division made it easier for both parties to obtain both religious sanction and religious condemnation for their work. This situation added greatly to the bitterness of the strife. The feeling between the pro-slavery and the anti-slavery elements became so pronounced in the next few years that both Whigs and Democrats in the Presidential campaign of 1848, refused to make any definite statement on the slavery question. The anti-slavery Whigs resented this noncommittal position of their party and many of them joined in the formation of the Free Soil party which pledged itself to oppose the extension of slavery to the Territories. At the same time the new party declared that Congress was powerless over slavery in the States where it existed. The election of 1848 revealed a further tendency toward sectionalization among the voters of the two old parties. Because General Taylor, the Whig candidate, was a Southern slaveholder he received a much larger vote in the South, where the great strength of the Democrats usually lay; while Cass, the Northern Democrat, received somewhat similar support in the North, though not so striking on account of the Van Buren defection. For the next two years the gulf of sectionalization greatly widened.

The specific cause of contention was the question of slavery or no slavery in the territory obtained by the war with Mexico. The South felt that slavery must go into the new lands, not only because that section needed the new region to add to her weight in the councils of the nation, but, also, because the region was acquired largely through her own efforts. The North was becoming more and more outspoken in opposition to the extension of slavery into the new region obtained from Mexico. Nearly every northern legislature resolved in favor of the power and duty of Congress to prohibit slavery in the Territories. The legislature of Virginia resolved that if this principle be carried out the people of Virginia must either submit to "aggression and outrage" or resist "at all hazards and to the last extremity." Public meetings in several Southern cities approved the strong words of Virginia. Although the number in favor of dissolving the Union rapidly increased in the South and grew bolder in asserting their views, the great mass of people were yet true to the Union.

When, therefore, Henry Clay, by the unanimous vote of the legislature of Kentucky, was called from retirement and sent back to the Senate to restore harmony and to strengthen the weakening bonds of union his efforts met with sympathy and support on the part of the masses of the two sections. By the compromise of 1850, the admission of California as a free State and the abolition of the slave trade in the District of Columbia were balanced by the payment of $10,000,000 to Texas and by a new Fugitive Slave Law. "Union" meetings were held in various places to bring public opinion into hearty accord with the compromise. Nevertheless there were men in both sections who had little or no faith in the measure as a means of allaying the hostile sectional feeling. The greatest argument of the South in support of the compromise was the greatest argument of the North against the compromise — the Fugitive Slave Law (q.v.).

The drastic provisions of this law and the new zeal for its enforcement caused a wider development of the "Underground Railroad" (q.v.). But to hinder further the return of the fugitive to his master, some of the northern States began to pass Personal Liberty Laws. The Kansas-Nebraska Bill (q.v.), and the consequent contest for Kansas, led the majority of northern States to nullify, as far as possible, the execution of the Fugitive Slave Law by means of some such legislation as the Personal Liberty Laws. This legislation was cited by more than one seceding State, in 1860 and 1861, in justification of secession. Immediately, however, the South became more and more irritated because, on account of the opposition of Northern men, so few fugitives were returned, while the North became more and more irritated because, by the aid of Northern men, so many fugitives were returned. It is instructive to note that the people of the extreme Southern States, who lost few or no slaves, and the people of the extreme Northern States, who knew least about slavery, were the loudest in talk and most radical in action.

The growth of political association and interest which bound parties together had done much to strengthen the Union. But the excitement aroused by the passage of the Kansas-Nebraska Bill and the bitter conflict for the possession of Kansas destroyed the Whig party, and dealt the Democratic party a severe blow. Southern Whigs went over to the Democrats, while Northern Whigs joined with anti-slavery Democrats and Free Soil men in forming a new anti-slavery party, the Republican, a purely sectional party. The break-up of the Whig party left an inheritance of suspicion and ill-will that boded nothing but evil.

The election of 1856 resulted in a victory for the Democrats, but the Republicans carried all the Northern States but four. The falling off in the Northern Democratic vote was as ominous as the disappearance of the Whig party. Would, therefore, the oldest party in our history also break in two along sectional lines, and former political friends be turned into enemies? Such an event, many believed, would indeed hasten the disintegration of the Union.

It was probably clear to the great leaders of the Democratic party that if the struggle in Kansas should go on much longer, nothing could prevent the Northern and Southern wings from taking opposite sides. Hence, the decision in the Dred Scott case (q.v.) was hailed as the means of settling the dispute over Kansas by taking the question out of politics entirely. Chief Justice Taney, in rendering this decision, declared that, according to the Constitution, neither Congress nor the legislature of a Territory could exclude slavery from the Territory. The decision, in effect, placed the doctrine of Popular Sovereignty and the Republican party under the ban of being opposed to the Constitution. The question was not taken out of politics, for while the South applauded, the North denounced, the decision. Even Northern Democrats wavered in its support; for of what use was Popular Sovereignty, the doctrine of their favorite, Senator Douglas? The clearer this question became, the more uncertain became the question: Can the Democratic party be held together in support of the slaveholders' view? The Lincoln-Douglas joint debates, in 1858, settled that question in the negative. Lincoln forced Douglas to admit that he believed that a Territory could exclude slavery from the limits in spite of the Dred Scott decision. Douglas took this stand in order to keep faith with the Democrats of Illinois and of the North. But Southern leaders watched the debate with deep interest, and were mortally offended at this position of Douglas. They immediately began to take steps to "read him out of the party." But Douglas went into the national Democratic Convention at Charleston in 1860 with a majority of delegates in his favor. They stood faithfully by him and voted down the platform of the southern wing of the party. Southern delegations, one after another, withdrew from the convention, and the party of Jefferson and Jackson was broken in two. Later, in convention at Baltimore, no compromise could be reached, and both factions nominated presidential candidates. With the Republican party, there were thus three sectional parties in the field. How completely the people were imbued with sectional feelings may be seen from the fact that the one party — the Constitutional Union — which professed to be a national party and urged the putting away of sectional questions received only 80,000 votes in the North. Douglas obtained about 1,300,000 votes, but only 163,000 from the slave States. Lincoln received but 26,000 of his 1,800,000 votes from the South. The strong ties of political association were breaking under the strain of sectional hostility, and it seemed that the only thing wanting was some overt and formal act to certify to the division in sentiment which already existed. When, however, South Carolina took the leap, after Lincoln's election, and six other States followed her example, and when it became apparent that secession meant a conflict of arms, then those deeper and more fundamental interests than party politics began to assert themselves. The conservative forces born of the history of the past and of the hopes of the future began to call out for concession and compromise. During the winter of 1860–1861 Congress, under pressure of the conservative interests and patriotic feelings made vigorous efforts to allay the demon of sectionalism. The Peace Convention (q.v.) which met in Washington in February 1861, also endeavored to aid in restoring harmony. But the movement of events was too rapid. Lincoln was in the Presidency but a few weeks before Sumter fell, and the two sec-

tions were at war. It is of little consequence which of the parties struck the first blow, for there seemed nowhere any power or influence strong enough to long prevent sectional animosity from bursting into flame.

The causes of the war, or rather of secession, as viewed by the South Carolina Secession Convention are here briefly epitomized: (1) The American Revolution established the right of a State to govern itself and the right of a people to abolish a government, and that each colony became a free, sovereign, and independent State. (2) That the Constitution is a compact and was agreed to by sovereign States. Since the obligation established by a compact is mutual, its violation by a single party to the contract releases the others. (3) We assert that 14 States have refused for years to fulfill their constitutional obligations by hindering the return of fugitive slaves. (4) "These States have assumed the right of deciding upon the propriety of our domestic institutions" and have denounced as sinful the institution of slavery. (5) They have permitted societies to disturb the peace and incite servile insurrection. (6) They have elected a man President who is hostile to slavery and who has declared that the government cannot endure permanently half slave and half free. This analysis of the causes as stated by the first State to secede shows that the irritating and real cause was the question of slavery and that the doctrine of State sovereignty was used as a justification of the act of secession.

Finally it may be said that another cause which hastened the sectionalization of opinion and interests was the very great ignorance of the two sections of each other. The main lines of migration, travel, and commerce were east and west instead of north and south. This situation promoted ignorance, and ignorance promoted suspicion and hate. The result was that the people of the extreme North and of the extreme South had the most exaggerated notions of the characters, manners, and views of the other. From these portions of each section came the bitterest partisans in the conflict. There was little toleration in their views. But the people who neighbored across "Mason and Dixon's Line" were very different in their attitude. Their position was born of personal experience. They knew each other and knew that men on opposite banks of the Ohio River were really more alike than different. Whatever of moderation there was in the conflict was largely due to the people of the border States. Does not this justify the conclusion that if the two sections had really known each other the contest would have lost much of its bitterness and might have taken another form, and the controversy have ended short of war? Certainly the nation paid a dear price for its partisanship and sectional bitterness.

W. H. Mace,
Professor of History, Syracuse University.

34. **United States — Secession.** The secession of 11 Southern States of the American Union during the winter and spring of 1860–1 is the most significant fact in American history after the adoption of the Federal Constitution. It was the one great attempt to make of the United States two republics instead of one, and the struggle which it precipitated decided that this could not be and that the Federation of 1787–9 had become a nation.

Whether secession was a reserved right of the original members of the Union is the first inquiry that arises. From the reasoning of the founders of the national Constitution during the decades of fierce political controversy which followed the inauguration of the government one is compelled to believe that such right was considered as still residing with the States, though Madison gives strong grounds for the contrary opinion in the writings of his early as well as his later life. As to whether this right was reserved it should be said that there is today a marked difference of opinion among historical scholars. That the States conferred whatever authority the Federal government had and that this central authority was strictly and specifically limited are propositions no longer seriously disputed.

The threat of Virginia and Kentucky in 1798 to prevent the enforcement of the alien and sedition laws (q.v.) within their boundaries; the public declaration on the floor of Congress by leaders of New England public opinion in 1807 to 1811 that the commercial States would be justified in seceding from the Union; and the actual meeting of the Hartford convention in 1814 to consider ways and means of resisting the national authority would all seem to establish the point that the right of secession was claimed by each of the two great sections of the Union. These incidents are of further importance because they occurred within the lifetime of many of the framers of the Constitution and because many of these "framers" publicly espoused the views thus enunciated.

The Supreme Court of the United States, however, began about 1810 to expound the Constitution in a spirit of healthy nationalism. Chief Justice Marshall repeatedly affirmed the doctrine that the central government was that of a nation and that the rights of the States must be subordinated to the requirements of an enlightened national policy. This attitude of the court was vigorously and solemnly opposed by the Supreme Court of Virginia in 1815. In the celebrated lawsuit of Martin *v.* Hunter's lessee appeal had been taken to the United States courts by means of a writ of error. Judge Marshall, with the unanimous agreement of his colleagues on the bench, reversed the decision of the Virginia court and issued a mandamus on the latter to execute the decree of the former. The judges of the Virginia court now entered into a painstaking examination of the case and not only declined to honor the mandamus but declared in published opinions that the United States Supreme Court was usurping powers not granted and thereby encroaching on the rights of the States. The policy of the Supreme Court was repudiated and the authority of the State courts even in cases involving the interpretation of treaties with foreign powers was asserted and incidentally the sovereignty of the States was maintained as staunchly as in 1798 — the right of a State to judge of infractions of the constitutions being emphatically re-asserted. The right of secession was not advocated in terms, but any one could see that this was only a step further in the process.

During the years 1815 to 1822 the leading

men of Virginia, including ex-President Jefferson, constantly excited public opinion against what they declared to be the dangerous teaching of the national courts. Virginia took the position she had occupied in 1798–9. Madison, however, protested against this later Virginia view, but rather on the grounds of expediency than otherwise. Other States followed the example of Virginia. Clearly then it was not a settled question in 1820 and the aggrieved party, whether North or South, claimed rights which, in the last analysis, were equivalent to a withdrawal from the general compact.

What caused the matter to be more difficult of settlement was the fact that there was no final authority, no judge between the two parties. An infraction of the general constitution, that is, a violation of the contract between the Union on the one side and the States on the other, was a matter that could not be satisfactorily determined since there was no outside tribunal whose judgment could be accepted as disinterested. Jefferson thought, on the whole that the States should be the final judges; Madison inclined with the exception of a few years of his life to the opposite view, while both Washington and Hamilton had held that the national government was to be its own judge in such cases.

In 1832 South Carolina formally annulled the tariff laws of the Union and the State of Georgia had steadily refused to recognize the authority of the United States courts within her boundaries during a period of several years beginning with 1825. After the passage of the fugitive slave law of 1850 and especially after the Dred Scott decision of 1857, many Northern States refused to obey the national authority and in various instances passed laws to prevent enforcement of the laws of the Union.

Further still actual secession was not unfamiliar to Americans. The counties of Western North Carolina (now Tennessee), just prior to the formation of the national government, had formally declared their independence and then proceeded to establish a separate and independent government. This new sovereignty, called the State of Franklin, was successfully maintained for four years, 1784–1788. Western Pennsylvania and Northwestern Virginia made a similar attempt to secede both from their mother States and from the Federal Union in 1794; in 1805 to 1807 there was danger that Kentucky, Tennessee and parts of the Louisiana cession would withdraw their allegiance from a government which was thought not to be sufficiently jealous of Western interests. The principle of local autonomy and local sufficiency was so universally accepted in the various sections of the United States that such threats and outbreaks were not surprising; they were not thought to be positively unlawful. Yet public opinion supported the Executive in putting down the Whiskey "insurrection" as it was called and President Jefferson did not sacrifice his popularity by taking vigorous measures to prevent what appeared to be a dangerous movement led by Aaron Burr in 1806. In 1814 the strongest organs of public opinion in Virginia recommended the use of force against New England in case of secession and the terms of "traitor" and "treason" were frequently applied to leading opponents of the war with Great Britain. The vigorous and prompt proclamation against the proposed plan of South Carolina by President Jackson was a prominent cause of that leader's lasting popularity South as well as North. However, it was not quite decided then that a State could not withdraw from the Union, in which case, of course, no national law would have force within its jurisdiction. Calhoun, the author of nullification, did not at that time advocate secession. He relied on the Jeffersonian teaching of 1798, that the State was the proper judge of the validity of a national law in so far as that State was concerned. The debate between Webster and Hayne brought to light the fact that a genuine national spirit had arisen in the North and that the conservative particularism of the earlier years had entrenched itself in the Southern States. Meanwhile economic forces had begun to crystallize in such a way that disunion seemed to offer advantages to the South.

When the fierce struggle over Missouri was waging certain strong and far-seeing Southern leaders who regarded negro slavery as essential to the Southern economic and social structure declared that the James River and the Kentucky-Tennessee boundary was a natural line of cleavage between two civilizations which were growing up within the bounds of the United States. John Randolph and Nathaniel Macon held this view and there were a few others who agreed with them. The Missouri Compromise was considered by them a great blunder, notwithstanding its Southern origin. They declared it a violation of the national compact. From this time forward the development of the cotton plantation as the typical Southern institution of everyday life caused negro slavery in the lower South to appear to be an absolute necessity. Climate, soil and social habit combined to raise the institution from the position of a necessary evil to that of a benevolent system working alike for the up-building of the slave and his master. The price of cotton regulated the price of the negro; and the demands of the world's commerce grew faster than the supply of cotton. The economic life of this section was centred in this industry, and the profits were so great that with a small capital the younger sons of the older families of the South-Atlantic seaboard could become independent planters in a few years and in a decade or two they became masters of vast estates with hundreds of slaves. Three factors entered into the makeup of these fortunes: cheap lands, negro slaves, and a demand for cotton. The supply of cheap lands seemed inexhaustible, the demand for cotton as already noted continued to increase, negroes alone were limited in supply and they died very rapidly in the cotton belt. Maryland, Virginia, and the Carolinas began early to send their surplus slaves south; as the price mounted from $300 in 1820 to $1,000 in 1850 the stimulus to raising negroes increased and the immorality of the business appeared less evident. This is the development which brought unity of economic interest to all the Southern States from Virginia, at least, to Louisiana.

It was but a natural step after 1833 to combine the inherent Anglo-Saxon idea of local autonomy with the economic interest of this group of States. And the almost universal resort to agricultural pursuits caused the operation of the national tariff to appear sectional, favoring the manufacturers of other sections at the expense of the cotton growers, who, having no competitors in the world's markets, could not ask for protection as did the industrialists of the North and East. The tariff became the object of the Southerner's most determined opposition. In Virginia college students formed anti-tariff clubs, taking vows not to wear tariff-favored clothing. And it required but little invention to combine these ideas with those older ideas of State supremacy which had been so prevalent immediately after the Revolution. Nullification became secession and all the more rapidly since the great nullifier, John C. Calhoun, soon gave up the former for the latter constitutional doctrine.

All these forces tended to build up a peculiar civilization, a peculiar social system south of the famous Mason and Dixon's line. Heads of families became patriarchs with numberless dependents looking up to them for their daily bread, and these chiefs naturally assumed the leading roles in State and local government. Government itself became a social affair and office-holding remained the badge of honor. These masters at home undertook quite as naturally the representation of their States in the national congresses and cabinet. And since 3 negroes out of every 5 were counted in the apportionment of representation in Congress, the owner of 500 slaves was equal in political power to 301 voters in the North. This had secured to the South a preponderance of influence in national legislation until about 1830, when the West and Northwest began to loom large on the horizon of the future.

Texas, embracing an area of 270,000 square miles, declared her independence in 1836. Mexico was unable to suppress the revolution. The great majority of Texans were from the Southern States; they were also slave-holders. A new State — Texas — entered the family of nations. It applied, however, for admission into the United States in 1837. This meant an expansion of the territory of the South. It might serve as a check-mate to the West should it fail, as was clearly evident, to co-operate with the South in party policy. But admission of the new State was opposed by the Northern representatives. After a struggle of several years the new State was finally admitted in 1845. This controversy embittered the sections of the country and threats of secession had been freely and boldly made in the South during the campaign of 1844 in case the new territory should not be admitted.

Admission of Texas meant a declaration of war on the part of Mexico and war with that feeble and rather decrepit nation exposed a vast region of country stretching from Santa Fé to San Francisco to American conquest. In the war that ensued every thing that could be desired was won. But not being content simply to despoil a weak neighbor the United States offered by way of conscience salving, to pay for the territory so ruthlessly seized. When the bill authorizing the payment of a portion of the money came up in the House of Representatives David Wilmot of Pennsylvania offered his famous proviso (see Wilmot Proviso), prohibiting the introduction of slavery into the country to be acquired. This aroused the ire of the Southern leaders, as was to have been expected. From 1847 to 1850, the date of the second series of compromises on slavery, the South was agitated as never before and in every State strong secession parties arose.

The South was ripening for a revolution. William L. Yancey (q.v.) of Alabama, had recognized this; he had given up his seat in the national House of Representatives in 1846 and from that time forth appealed to the people of his State to yield nothing whatsoever to Northern sentiment concerning slavery. He demanded that all territory to be acquired from Mexico should be kept open to slave settlement, and a failure to protect slave-holders in their rights he declared to be a violation of the national compact. Yancey was a fiery orator not inferior in the control of popular passion to Wendell Phillips; he was in fact the Southern counterpart of Phillips. In 1848 he prevailed on the Alabama State Democratic convention to adopt his ideas which soon became known to the country as the "Alabama Platform." At the National Democratic convention of that year Yancey presented resolutions embodying the Alabama platform; they were rejected, and Yancey withdrew from the convention. Lewis Cass was nominated for the Presidency on an evasive platform. Yancey canvassed Alabama urging rejection of Cass. Gen. Zachary Taylor, the Whig candidate, was elected President. In 1850 when the agitation came to an issue in Congress on the question of the admission of California, Yancey advocated the secession of all slave-holding States.

In February 1849, the Virginia legislature declared almost unanimously that the Wilmot proviso, if passed, would meet with "resistance at all hazards and to the last extremity" in that State. South Carolina followed with a recommendation for a convention of the Southern States; 3 Oct. 1849, Mississippi held a Southern rights convention which embodied the principles of the Virginia resolutions in an address to the people. As a result of this agitation Southern rights associations and committees of correspondence were organized in every section of the South. Throughout the North public opinion was crystallizing against the South on the subject of slavery; leading men were opposed to what was termed a "further surrender to Southern demands."

When Congress met, all the subjects in dispute were summed up in the proposed "compromise of 1850" (q.v.). The South was thoroughly aroused. The Mississippi delegates in Congress unanimously asked their State legislature for instructions how to vote on the compromise measures. The reply was a condemnation of the proposed compromise and the election of delegates to the Nashville Convention to be held on the first Monday in July 1850. South Carolina followed suit. The other

Southern States in irregular manner chose delegates to the Nashville Convention. But when the representatives came together they proved to be conservative. Formal protests against the principal items of the compromise bill still pending were voted; but no threats were offered and the body adjourned to meet on the call of the President, who was a Whig and supposedly not unfavorable to Henry Clay's last great scheme. The convention never met again. This meeting had been intended on the part of South Carolina and, perhaps, Mississippi, as the first great step toward concerted action on the question of secession. It failed. The secessionists were still in a minority in all the Southern States except South Carolina and possibly Mississippi and Texas. Congress after much angry debate passed the "compromises." The abolitionists of the North declared that the cause of humanity and good morals had been betrayed. Their speakers were applauded when disunion was threatened or when it was asserted that the fugitive slave law, one of the items of the compromise, could not be enforced. Nearly all senators from the Southern States signed a formal protest against the compromise and had it published in the record.

Co-operation among Southern States having failed, separate State action was now recommended, and South Carolina led off with a State convention in 1851, but failing to get a two thirds majority in that body the secession party failed again. The agitation was continued. In Georgia, Alabama, and Mississippi, States Rights conventions were held and resolutions still looking to secession were adopted. In the elections which ensued in all the cotton States the extremists were so badly beaten by a combination of Whigs and conservative Democrats that the movement was given up and the compromises were acquiesced in. Even Robert Barnwell Rhett (q.v.), the arch-secessionist of South Carolina, gave up the fight, resigned his seat in the United States Senate and retired to his plantation.

Notwithstanding the opposition in the North to the fugitive slave law, and the persistent discontent and agitation of such men as Yancey in the South against the so-called unequal opportunity of slave-holders in the Territories, the sober element of the country accepted the compromises of 1850. The election of 1852 confirmed this view. The Democrats, who had come to be the conservative party of the nation and who emphasized the importance of quieting both the abolitionist and pro-slavery agitation, elected their candidates almost without opposition. The President, Franklin Pierce, chose his cabinet from both North and South; he without any doubt meant to "let sleeping dogs lie."

However, the country was at heart divided, and when the administration paid $10,000,000 to quiet the claims of Mexico to lands on our Southwestern frontier it was taken by serious and conservative people as a sign that the South was really in the saddle and that the slave-expansionists meant to make use of their position; but later when the bill for the erection of the portion of the Louisiana Purchase territory now known as Kansas and Nebraska into a territory came up it was impossible to prevent the representatives of our two civilizations from renewing the struggle for supremacy. Senator Douglas thought to solve the whole problem by enacting a law giving both sections of the country equal chances to win possession of new States, that is, the new-comers, whether pro- or anti-slavery in sentiment and practice, were to be protected by national law until the population of the new Territory had grown large enough to be admitted as a State into the Union. In the formation of a State constitution the question of slavery was to be settled according to the interests and wishes of the majority. This was local or "squatter sovereignty" (q.v.), as it was called. The advocates of this scheme thought it would please the North because that section would feel certain that her teeming population of free emigrants would secure to her the control of the new States. The South would have all cause of complaint removed because she would at least have the opportunity to plant her standards in all the common territory without official interference and under the guarantee of national protection.

But this meant the repeal of the Missouri Compromise (q.v.), by this time a sort of fetich in the eyes of the majority of people in the Northern States. It also meant the undoing of the now accepted legislation of 1850. But a strong party arose declaring that the Missouri Compromise was itself unconstitutional — the idea advanced by John Randolph and a few of his friends in 1820. The press of the South almost without exception joined in the demand for the open and formal repeal of the compromise legislation and for the adoption of the popular sovereignty plan. The cabinet approved the new and radical departure and during the spring of 1854 Congress debated and passed the Douglas bill by large majorities and the President made it a law on 30 May, 1854.

Immediately Kansas and Nebraska (q.v.) became the battle-ground of the two parties and in every State the war of words was waged hotter than ever. During the summer of 1854 "anti-Nebraska men," as they were called, met together in their various States and formed local organizations. They were able to secure the election of 103 members of the national House of Representatives and 15 senators. The new party, made up of remnants of all the older parties and embracing not a few abolitionists, took the name of Republican and declared unceasing warfare on the further spread of slavery. The next year it polled 114 electoral votes as against 174 for the Democratic candidate.

The Democratic party from 1852 to 1860 accepted either positively or negatively the chief tenets of the Southern constitutional theory: (1) States rights, (2) low tariff, (3) non-interference with the expansion of the slave power. The party was in the main dominated by Southern men. During the Pierce administration, in addition to negotiating the Gadsden Purchase (q.v.), and repealing the Missouri Compromise, the leaders of the Democratic party committed the country to the annexation of Cuba even by force if necessary and the administration failed

to punish Southern filibustering expeditions directed against Mexico and Central America. President Buchanan in 1857 publicly endorsed the aggressive Democratic policy. He called to his council board such pronounced pro-slavery men as Howell Cobb, Jacob Thompson, and John B. Floyd, and he relied too much upon these men for advice in every crisis, which was but natural, since so few Northern States had cast their electoral votes for him.

In the South during these years the aggressive sectionalists continued to urge the people on to secession as the only guarantee of their safety. Commercial conventions which discussed politics met each year in one of the larger Southern cities. These bodies recommended the boycotting of Northern manufactures, the encouragement of direct trade with Europe, the reopening, even, of the African slave trade. The Southern press took up the programme and kept the agitation of sectional issues at the highest pitch of excitement. Parents were criticised for sending their sons to Princeton and Yale to be educated; States legislatures were urged to establish and generously support military schools. Secession was often and in all sections of the South threatened in the event that the Republican party should succeed in electing a President.

In 1857 the Supreme Court added fuel to the fire by going out of the way to declare that Congress could not lawfully interfere with slavery in any Territory of the United States and that any slave-holder must be protected in his rights in all sections of the country. (See Dred Scott Decision.) The result in the North was the immediate supremacy of the Republican party, whose one idea was that slavery should not be permitted to expand, but should be limited to the States in which it had prevailed for years. Lincoln expressed the view of the advanced thought of the North when he said this nation can not long endure "half slave and half free"; it must become all one or all the other. His programme was that steps should be taken to fix the bounds of the institution and to assure the nation that slavery was under process of final extinction. He was nominated as the Republican candidate for the Presidency in Chicago in May 1860, and elected the following November.

The Democratic party still insisting on its conservative, free trade, pro-slavery programme, met in Charleston, South Carolina, in April 1860. After some attempt on the part of some Eastern men to nominate Jefferson Davis on a Douglas platform and on the failure of Yancey to get his famous "Alabama platform" adopted the convention split asunder, the Southern extremists following Yancey out of the convention hall in dramatic fashion, the Douglas men adjourning to meet again in Baltimore in June. Attempts were made during the succeeding months, especially after the nomination of Lincoln, to reconcile the two wings of the convention and thus unite on a candidate, but to no avail. The two branches of the Democratic party met in Baltimore and nominated separate tickets: the Northern men naming Douglas and Johnson, of Georgia, and the South putting forth Breckenridge and Lane on an aggressive pro-slavery platform.

An exciting campaign was waged throughout the country. In the South Yancey was the principal orator. He had finally brought his section to accept the programme which he had written for the Democrats of Alabama 12 years before; his powers of speech, the evident sincerity of motive which animated him and the universal interest in the campaign gave him vast audiences everywhere. Every Southern State but three voted as he asked and in the States which did not support him, his party strength was very great. Douglas canvassed the North manfully, but he received the vote of but two States, New Jersey and Missouri. Lincoln received the majority of the electoral vote.

It was generally understood among Southern politicians that South Carolina would promptly secede in the event of a Republican victory. The Gulf States were expected to follow suit. The South Carolina plan was the same that Barnwell Rhett had urged in 1850–51 and Rhett, having been some years now the editor of the Charleston 'Mercury,' had come forward again the leader of a State completely converted to his way of thinking. The Palmetto State seceded by unanimous vote of a convention of her ablest men on 20 Dec. 1860. By 6 Feb. 1861, the tier of Southern States from South Carolina to Texas withdrew their allegiance from the Union and reassumed the sovereign powers which had been surrendered to the national government.

The agricultural life of the South had developed slavery as a fundamental factor in her economic life; on this basis had been erected a feudalism of a high order, a social system unique in modern times. To protect this system from the hostile encroachments of an unsympathetic outside world, the leaders of this section had since 1820 entrenched themselves behind the popular doctrine of States rights. Accepting this dogma without question the State of South Carolina made a single-handed fight in 1833 against the national tariff system as based on false interpretation of the national compact. The nation gradually adopted the Southern view and steadily lowered the tariff duties until in 1857 the country was placed practically on a free trade basis. Constantly threatened by representatives of Northern and Eastern States with the declaration that "slavery must go," the champions of this new feudalism had accepted the issue with the aggressive North on the slavery question in the hope of winning again. Failing in this secession was resorted to as the only alternative.

South Carolina sent commissioners to Washington to negotiate with the President concerning the delivery of Fort Sumter and other property of the United States within the bounds of the seceded State. President Buchanan declined to receive them, but indicated a strong desire to avert hostilities. South Carolina demanded the surrender of the forts she claimed as her own. Meanwhile the State of Virginia had procured the assembly of a Peace Convention (q.v.) with the aim of bringing about a compromise. This failed to get consideration in Congress which had met in

regular session. Then Senator Crittenden of Kentucky proposed his scheme (q.v.) of pacification; this failed to satisfy either the extreme republicans or the determined secessionists, and events were left to shape themselves until the incoming President should be installed.

A convention of Southern delegates met at Montgomery on 4 Feb. 1861 to draw up a provisional constitution. This work was done in a few days and Jefferson Davis of Mississippi, recently a distinguished senator in Congress, was elected President, with Alexander Stephens of Georgia, for Vice-President. The new Constitution was in most points quite like that of the old Union, the changes, with a few exceptions, being improvements on the old. This government went into operation at once, the United States forts and arsenals within the bounds of the confederation being promptly seized and strengthened for the benefit of the new Union of States. Secession was a *fait accompli*.

But from December 1860, to April 1861, the Northern people were anxiously debating the question whether there was a nation and whether this nation could coerce a seceded State or group of States. The firing on Fort Sumter on 12 April 1861, by the Confederate and South Carolina authorities decided these questions in the affirmative. President Lincoln called for troops to suppress what he called a revolt. This call forced Virginia, North Carolina, Tennessee, Arkansas, Kentucky and Missouri to decide on which side they would cast their lots; the two last named States determined to remain neutral; Virginia, North Carolina, Tennessee, and Arkansas all before the middle of June joined the Confederacy. The capital was removed to Richmond; armies were rapidly enlisted; diplomatic agents were sent abroad; a regular government succeeded the provisional without serious friction. But the people of the Northern States had decided that a breaking up of the Union was unthinkable, criminal, treasonable, and as such must be suppressed. The war began in earnest, and four years later all parties agreed to a peace which denied forever the right of secession, which yielded to the Union the constitutional right to lay such tariffs as were deemed necessary by Congress and which abolished African slavery forever and destroyed the social system which had been erected upon it. (See also SECESSION IN THE UNITED STATES.) Consult: Rhodes, 'History of the United States Since the Compromise of 1850'; McMaster's and Schouler's histories of the United States; Von Holst, 'Life of John C. Calhoun' in American Statesmen series; and Woodrow Wilson in the 'Cambridge Modern History,' Vol. VII.

WILLIAM E. DODD,
Professor of History, Randolph-Macon College.

35. United States — Military Events of the Civil War. The flag of the United States was first fired upon during the Civil War by some batteries erected against Fort Sumter in Charleston harbor. The occasion was the appearance of the Star of the West on 9 Jan. 1861, off the harbor, bringing supplies of provisions from New York for Fort Sumter. This fort, under command of Major Anderson, was forced to surrender to Gen. Beauregard 14 April 1861. Thereupon President Lincoln issued a proclamation calling for 75,000 volunteers. In the spring of 1861, after some skirmishes between Union forces and Confederate troops dispatched to western Virginia to hold that section within the Confederate lines, West Virginia seceded from Virginia and passed permanently into the Union lines. In July the army in front of Washington, under Gen. McDowell, prepared to advance against the main Confederate army, under Gen. Beauregard; and the encounter took place on the 21st at Manassas, where, on the arrival of the last brigade of Johnston's army, Beauregard's attack upon the Union flank turned McDowell's advance into a disorderly retreat, the army fleeing back to Washington. This signal defeat of the Union arms produced great mortification and consternation at the North. But the South was correspondingly elated and regarded this brilliant victory as an augury of the ultimate success of the Confederate cause. Both sides now proceeded to make more vigorous preparations.

Gen. McClellan was summoned from West Virginia and given command of the Department of the Potomac, and forthwith he set about organizing the troops rushing in from all parts of the North. On 20 August he took command of the Army of the Potomac, now first organized under that title, and 1 November he was appointed commander-in-chief of the armies of the United States, superseding Gen. Winfield Scott, who was retired, at his own instance, because of failing health. After the battle of Bull Run but little hard fighting occurred during the remainder of 1861. Both sides contented themselves with establishing their respective lines. On 15 August President Davis ordered all Northern men to leave the South within the next 40 days. President Lincoln thereupon proclaimed the seceded States in rebellion and prohibited all intercourse.

Early in 1862 the Confederate line through Kentucky was broken by separate attacks under Gen. Thomas and Gen. Garfield. On 6 February Admiral Foote's fleet, with the aid of Gen. Grant's forces, captured Fort Henry on the Tennessee, and Grant then moved on Fort Donelson and forced it to surrender, 16 February, with 15,000 men. On 7 April Gen. Pope captured Island No. 10. About the same time Gen. A. Sidney Johnston, with headquarters established at Corinth, attacked Grant awaiting Buell, at Shiloh Church, near Pittsburg Landing. Johnston was killed, and Beauregard in command of the Confederates was driven back by Grant and Buell, who had meanwhile joined him. Defeated, Beauregard returned to Corinth. The Federals now began an advance on Corinth. The Confederates ordered Price and Van Dorn from west of the Mississippi to defend the city; but on Halleck's drawing near Corinth, it was learned that the Confederates had already evacuated it. Gen. Bragg, who had succeeded Beauregard, proceeded to Chattanooga by way of Mobile, forcing Buell meanwhile to withdraw to the Ohio to protect his department. At the same time Gen. E. Kirby Smith invaded Kentucky, and defeating the Federals at Richmond on 30 August, he threatened Cincinnati. Thereupon Buell advanced from Louisville against Bragg, who, as a result of the battle of Perryville on 8 October, was compelled to abandon Kentucky,

In September Price and Van Dorn advanced against Grant and Rosecrans, near Corinth, and were both defeated. After this campaign Rosecrans was sent to relieve Buell in command of the Army of the Cumberland, 30 October. On assuming command Rosecrans concentrated his army at Nashville. On 26 December he moved toward Murfreesboro to attack Bragg, and there ensued a three days' battle ending 2 Jan. 1863. Rosecrans occupied Murfreesboro, and Bragg retreated to Shelbyville, Tullahoma and Wartrace. Both armies then went into winter quarters. On 8 March 1862 the Union fleet in Hampton Roads was attacked by the Confederate ironclad Merrimac, which inflicted heavy loss. However, on the following day the Merrimac was met by the Monitor and, after a severe engagement, retired to Norfolk, where she was blown up at the evacuation of that city by the Confederates, 9 May. The western rivers, too, were the scene of some active naval engagements. Farragut's fleet did effective work on the Mississippi, taking New Orleans 1 May, and a little later Baton Rouge and Natchez. The Confederate flotilla under Commodore Montgomery was destroyed by Commodore Foote's fleet, in a desperate fight before Memphis, 6 June; and Memphis surrendered to the victorious fleet. At Galveston, however, the Confederates under Magruder, with the aid of an ordinary river fleet, won a brilliant victory; and the Alabama (which was sunk by the Kearsage off Cherbourg in 1864) captured the gunboat Hatteras.

In March McClellan, who had been lying inactive so long, began his noted Peninsula campaign which terminated in utter failure. His advance was opposed by Gen. J. E. Johnston, who gradually fell back toward Richmond till he reached Seven Pines, or Fair Oaks. Here the armies met on 31 May. The timely arrival of Sumner's corps from the other side of the Chickahominy saved McClellan from serious disaster. Johnston being badly wounded, Gen. G. W. Smith succeeded to the command temporarily. On 2 June Gen. R. E. Lee was assigned to the command of the Army of Northern Virginia, which he retained till the close of the war. Gen. "Stonewall" Jackson (q.v.), by a brilliant campaign in the valley, in which he defeated Banks at Winchester, forcing him across the Potomac, Frémont at Cross Keys, and Shields at Fort Republic, held most of McDowell's corps around Fredericksburg, thus preventing them from joining McClellan, and himself suddenly appeared, 25 June, at Ashland, on the flank of McClellan's army in front of Richmond. Thereupon followed the Seven Days' battles, beginning with Mechanicsville 26 June, and including Gaines' Mill and Malvern Hill, after which McClellan withdrew to Harrison's Landing on the James. The campaign proved a disastrous failure; and McClellan, having been relieved, 11 March, of the general command of the armies, now retained that of the Army of the Potomac and saw Halleck assigned to the chief command, 23 July.

After the withdrawal of the Army of the Potomac to the James, McClellan, against his protest, was recalled from the Peninsula to the vicinity of Washington. General Pope was now ordered to organize the corps of McDowell, Banks and Fremont into the Army of Virginia, to cover this movement and to protect Washington. With this army Pope advanced against the Confederate forces near Gordonsville, where, confronted by Lee and Longstreet, he retired behind the Rappahannock and was defeated at the second battle of Bull Run, 30 August. He then withdrew to Centreville, where he was reinforced by the corps of Sumner and Franklin from McClellan's army. His flank was attacked by Jackson at Chantilly. On 2 September Pope was recalled with his army to Washington and was relieved of his command, his forces being added to the Army of the Potomac under McClellan.

In September Lee set out for his invasion of the North, crossing the Potomac near Leesburg and moving toward Frederick. He captured Harper's Ferry and advanced to Hagerstown, thence retiring to Sharpsburg, where he was met by Hooker's corps of McClellan's army. A desperate fight ensued, 17 September, in which the losses were greater for one day's fighting than in any other battle of the war. Lee then withdrew across the Potomac, McClellan's army following him into Virginia, and resumed his position beyond the Rappahannock. Near Warrenton McClellan was superseded, 7 November, by Gen. Ambrose E. Burnside. Burnside took his position opposite Lee's army near Fredericksburg, and on 13 December attempted to cross the Rappahannock and assault Marye's Heights, only to be repulsed with terrific slaughter. The following month he undertook to cross the river above Fredericksburg and turn Lee's left, but the attempt proved a dismal failure, being known as the great Mud March. Thereupon Burnside was relieved of his command and was succeeded by Hooker, 26 Jan. 1863.

The winter of 1863 was spent in laborious, though fruitless efforts to capture Vicksburg, which, because of its strategic importance, the Confederates held strongly fortified. Grant and Sherman both failed. At length, in April, Grant began his second move upon the city from the south and east. Admiral Porter's fleet convoying the transports ran the batteries on the night of 16 April, and the advance of the army crossed the river, 30 April. On 1 May Port Gibson was captured and Grant had forced his way to the rear of Vicksburg. Preventing a junction of Pemberton's and Johnston's forces, Grant defeated the former at Champion's Hill, and again at Big Black Ridge, 18 May, pursuing him into Vicksburg. After two unsuccessful assaults upon the fortifications, Grant undertook the siege of the city, which surrendered, 4 July 1863. This event was a turning point in the war in the West, hardly less important than Gettysburg in the East. Hooker opened the campaign of 1863 in the Army of the Potomac by crossing the Rappahannock at Fredericksburg and advancing to the Rapidan. At Chancellorsville the Union right was disastrously routed by Jackson's corps, 2 May. In the night, while reconnoitering before his pickets, Jackson was mortally wounded by his own men, who mistook him for the enemy. On the following day Hooker was forced back, with heavy loss, and recrossed the river, 5 May. Hooker being utterly defeated, Lee set out from Fredericksburg, on 3 June, for a second invasion of the North. The advance under Ewell, after some minor engagements in the valley, crossed the Potomac at Williamsport,

1. U. S. Grant. 2. Robert E. Lee. 3. William T. Sherman.
4. Thomas J. (Stonewall) Jackson. 5. Philip H. Sheridan.

15–16 June, and moved on to Chambersburg and the vicinity of Harrisburg and Columbia, capturing York on 28 June. Ewell was then ordered to fall back to Gettysburg, where Lee was concentrating his army. The Army of the Potomac under Hooker had advanced meanwhile to Frederick, where Hooker requested to be relieved; and Meade was assigned to the command. The two armies encountered each other at Gettysburg and after a three days' battle, 1–3 July, Lee retreated and recrossed the Potomac, without a battle. After a month's rest in the Shenandoah, Lee resumed his former position below the Rappahannock, Meade following him thither.

The campaign of 1863 in the Army of the Cumberland had as its objective the recovery of middle Tennessee. Rosecrans forced Bragg from his lines along the Duck River; and Bragg retreating over the Cumberland crossed the Tennessee and arrived in the vicinity of Chattanooga. The Union line being advanced to the western base of the Cumberland, a campaign against Chattanooga was begun. Grant, now assuming general command of the military division of the Mississippi, arrived 23 October; and with the Army of the Cumberland under Thomas and with a force from Vicksburg under Sherman and one from the Army of the Potomac under Hooker, Grant fought and won the battles of Lookout Mountain and Missionary Ridge, 24–25 November, and forced a general retreat of the Confederates, thus securing Chattanooga to the Federals. Knoxville, held by Burnside, was besieged by Longstreet, who, when Sherman approached, retreated to Virginia. In the meantime Charleston harbor was the scene of formidable attack and brilliant defense, and on 16 November the city was bombarded.

On 12 March 1864 Grant, now commissioned lieutenant-general, was placed in command of all the Union armies. He planned a combined movement of the armies: Gilmore from South Carolina to join Butler at Fort Monroe for a move up the James to capture City Point, threatening Petersburg and Richmond; Burnside with an army from Annapolis to join Meade in command of the Army of the Potomac and advance against Lee's right to Richmond; Sherman, with the Army of the Cumberland under Thomas and the Army of the Tennessee under McPherson and the Army of the Ohio under Schofield, to move against Johnston's army at Dalton; and Banks, leaving the Red River country to Steele and the navy, with his army to move against Mobile. Grant operating with the Army of the Potomac under Meade, 119,000 strong, crossed the Rapidan 4 May 1864 and met Lee with 62,000 men in the Wilderness, and a great battle followed, 5–6 May. At Spottsylvania Court House both armies entrenched and from 8–20 May there was terrific fighting. Grant then moved toward the North Anna. Meanwhile, Sheridan, commanding Grant's cavalry, made a raid around Lee's army and met and defeated J. E. B. Stuart at Yellow Tavern, where Stuart was killed, 11 May. Grant's advance was opposed by Lee and desperate fighting occurred at North Anna and Bethesda Church. At Cold Harbor Grant attempted an assault along his entire line, only to be repulsed with a sickening slaughter, 3 June, and so failed to interpose between Lee and Richmond. But Sheridan, who had been sent against Fitzhugh Lee's and Hampton's cavalry, in the meantime defeated both at Trevilian's Station. Grant now moved toward the James, crossing at City Point and Bermuda Hundred now occupied by Butler.

Grant established his lines before Petersburg and notwithstanding his heavy fighting till 1 November (the mine explosion and battle of the Crater occurred 30 July), Lee's lines remained unbroken. Sigel's campaign in the Shenandoah ended in defeat at New Market, 15 June, and he was superseded by Hunter, whose movement against Lynchburg was repelled by Early. Early then invaded Maryland, threatening Baltimore and Washington, 11 July, after which he was compelled to retire across the Potomac. Again he advanced into Pennsylvania and burned Chambersburg, whence Sheridan drove him back into Virginia beyond Staunton and devastated the valley. Sherman moved against Johnston at Dalton early in May, and Johnston, stubbornly resisting, fell back to Atlanta. Johnston was succeeded by Hood, who, after several unsuccessful battles, evacuated Atlanta and invaded Tennessee, only to be thoroughly defeated by Thomas at Nashville, 15–16 December. Sherman occupied Atlanta 2 September, and after Farragut's brilliant naval victory in Mobile harbor, made his famous march through Georgia to the sea, occupying Savannah 21 December.

Early in 1865 the closing campaigns of the war opened. Terry, co-operating with Admiral Porter, captured Fort Fisher 15 January. On 1 February Sherman started north from Savannah, captured Columbia, after which event Charleston was evacuated, and on 19 March met Johnston whom he defeated after a sharp battle. In Alabama, Wilson, operating under Thomas, captured Selma with its immense war supplies, 2 April, and defeated Forrest's cavalry. The Army of the Potomac, the last to move in 1865, began a general movement to the left, 29 March; and there followed the battles of Dinwiddie Court House and Five Forks, 31 March and 1 April. On 2 April the Confederate entrenchments were carried and Petersburg was evacuated; Lee, abandoning his lines held so long against such heavy odds, began a retreat to Amelia Court House. After the fall of Richmond on 3 April, Grant, with his entire army under Meade and Sheridan, pursued Lee and forced him to surrender at Appomattox, 9 April. The number paroled was 28,231, all told, the worn-out remnant of Lee's brave and noble Army of Northern Virginia. In North Carolina Sherman and Schofield moved against Johnston, who occupied Raleigh, and compelled him to surrender on 26 April 1865. This was the end of the war. See CIVIL WAR; also accounts of various battles and engagements under their respective titles.

EDWIN W. BOWEN,
Department of Latin, Randolph-Macon College, Ashland, Va.

36. United States — The Confederacy. When the election of Mr. Lincoln by the practically unanimous vote of the free States was announced in the autumn of 1860, the slave States of the lower South made preparations to exercise what they regarded as their constitutional right of seceding from the Union. The Republican party had triumphed on a platform which de-

clared the Dred Scott decision of the Supreme Court to be a dangerous political heresy and which announced a determination to exclude slavery from the territories. This platform was regarded by the South as the culmination of a long line of grievances; its triumph seemed to justify secession. It is true that the Republicans were still in the minority in both houses of Congress and on the Supreme bench; but the election showed the increasing power of that party and pointed to its ultimate success. It is now evident that it was folly for the South to suppose that secession would be successful, but if it was to be attempted, the South showed great political sagacity and foresight in not waiting longer. The anti-slavery sentiment had been growing apace in the North, and to the writer the autumn and winter of 1860–1 seems to have been precisely the time to strike for a separation. The South, weak though it was, was stronger than it could have been at any subsequent period. This point should not be obscured by the disastrous consequences of secession. However this may be, it now seems clear that the slavery question, in its various phases, was the principal, if not the only, cause of secession, and, in its turn, secession was the cause of the war. This was the view taken by Vice-President Alexander Stephens after the war had begun — a view not inconsistent with his declaration before the war (21 March 1861) that "slavery was the corner-stone of the new Confederacy." This latter statement, it may be added, is often quoted by those who forget that 25 years before in the case of Johnson *v.* Tompkins, Judge Baldwin of the Supreme Court, said: "Thus you see that the foundations of the [Federal] government are laid and rest on the right of property in slaves. The whole structure must fall by disturbing the corner-stone." The struggle on the Northern side, therefore, was primarily to resist secession and to preserve the Union. Subsequently the destruction of slavery was included in the programme. On the Southern side, while the opposition of the Republicans to the extension of slavery in the territories, the "personal liberty laws," and the reproaches of the North touching the iniquity of the institution, carried all but the border States into secession, the active force in the war that followed this rash act was not so much the preservation of slavery as it was the determination to resist invasion and to maintain the right of secession or the right of revolution. The motive that led to secession was replaced by the motive of resistance to coercion. Thus can be explained the heroism and sacrifices of the four fifths of the Southern people who owned no slaves.

On 4 Feb. 1861, a congress of delegates from all the States that had seceded met in Montgomery, Ala. At this date only six States had left the Union: South Carolina, 20 Dec. 1860; Mississippi, 9 Jan. 1861; Florida, 10 January; Alabama, 11 January; Georgia, 18 January; Louisiana, 26 January. In Texas the ordinance of secession was not passed until 5 February, and it had still to be submitted to the people. The Texan delegates, however, arrived in Montgomery before this final ratification. All the delegates were elected by the same conventions that had passed the ordinances of secession.

The Montgomery Congress immediately proceeded to form a provisional government. On 8 February it adopted a provisional constitution, differing in some important particulars from the Constitution of the United States. Under this constitution, which, being provisional, was not submitted to the States, the delegates elected a president and a vice-president of the Confederate States of America, each State being allowed one vote. By the unanimous vote of the six States present, Jefferson Davis of Mississippi was elected president, and Alexander H. Stephens of Georgia, vice-president. On the 18th, some three weeks before Mr. Lincoln was sworn in, these officers were duly inaugurated. The constitution of this provisional government resembled so closely the permanent Constitution to be described later, that its provisions need not be given. It was to continue in force for one year, unless altered by a two thirds vote of Congress or superseded by a permanent government. A committee of two from each State represented in Congress having drawn up a permanent constitution, this instrument of government was promptly adopted by the Congress 11 March, and being submitted to the seceded States was with almost equal promptness adopted by them. This was accomplished by action of the same conventions that had passed the ordinances of secession. Where these conventions had adjourned, they were reassembled for the purpose. In no case does there seem to have been any demand for the calling of new conventions to ratify the constitution. It was thought important to organize the government as soon as possible.

In the meantime Congress had passed acts to raise provisional forces for the Confederate States, to authorize the president to borrow $15,000,000 at 8 per cent interest for the support of the government, to levy an export duty on each pound of cotton exported after 1 August, and to organize the post-office department. Courts were rapidly organized in the different States, but, as we shall see, the Confederate States never possessed a Supreme Court. The president was then authorized to receive from the various States such forts, arsenals, and other public establishments with their contents as they had taken possession of within their respective limits. The request of the president to this effect met with prompt compliance on the part of the States. With the hope of obtaining recognition from foreign governments, commissioners were sent to European countries, but they were unsuccessful in their missions. England, France, and other countries in the summer of 1861 acknowledged the belligerency of the Confederate States, but beyond this action they refused to go. A recognition of the independence of the new Confederacy would have been regarded by the United States as an act of hostility. In November 1861 J. M. Mason and John Slidell were sent as special commissioners to England and France respectively. After leaving Havana the English vessel in which they had taken passage was overhauled by the San Jacinto of the American navy, and these commissioners were forcibly removed. England demanded their restoration. The United States government at first hesitated, raising a hope in the Confederacy that war might ensue between the two countries. Finally, however, Lincoln said: "We fought England about this matter in 1812; we must give

up these men." Accordingly the commissioners were placed on board an English vessel and allowed to continue their voyage. On the 8th of August the Confederate Congress, to please foreign powers, had adopted all the provisions of the famous Declaration of Paris, except as to the use of privateers.

The provisional government of the Confederacy had hardly been in force two months before it came into conflict with the United States government. The occasion of this conflict was the demand of the Confederate authorities that Fort Sumter in Charleston harbor should be surrendered by the Union force that occupied it. Senator Douglas, though opposed to secession, had argued in the United States Senate that South Carolina was entitled to the possession of Fort Sumter; General Scott had advised its evacuation; and Secretary Seward had practically promised that it should be given up. The South, therefore, thought that a peaceable solution was in sight. But President Lincoln, after a period of indecision, decided to provision the fort, and on 8 April 1861 so informed the governor of South Carolina. The South had not desired hostilities; but the Confederate government thought it necessary to capture the fort and opened fire on it 12 April. This act precipitated war. The Confederate States, therefore, have generally been made to bear the odium of beginning hostilities. The question is debatable; for as Hallam says: "The aggressor in a war is not the first who uses force, but the first who renders force necessary." We are thus thrown back upon the question raised by Senator Douglas, which cannot be discussed here. The bombardment of Sumter stirred the North as by an electric shock. When on 15 April Lincoln called for 75,000 volunteers "to suppress combinations obstructing the execution of laws in seven of the Southern States," the free States rallied to his support. His determination, however, to coerce the Confederate States persuaded four of the border States, which had hitherto held aloof, to join the Confederacy. Arkansas seceded 6 May; North Carolina 20 May; Virginia 23 May, and Tennessee 18 June. Kentucky, Missouri, Maryland and Delaware having refused to secede, no more accessions were to come to the South. West Virginia, moreover, with a population of 250,000, detached itself from Virginia and remained loyal to the Union. The population of the Confederacy was about nine millions, of whom three and a half millions were slaves; while that of the Union States was approximately 22,000,000, an immense disparity of numbers. "Yet," said J. F. Rhodes, "had the North known that the people of the cotton States were practically unanimous, it might have refused to undertake the seemingly unachievable task; for while hardly a man in the North assented to the constitutional right of secession, all acknowledged the right of revolution. . . . Many would have objected to combating that right." The provisional Congress, being called together 29 April in Montgomery to consider the new condition of affairs, made provision for the prosecution of the war by adopting financial and military measures. On 6 May it passed an act, declaring that negotiations with the United States for a peaceable solution of difficulties had failed, and as Mr. Lincoln had called for 75,000 men to capture forts within the jurisdiction of and belonging to the Confederate States of America, and had issued another proclamation announcing his intention to set on foot a blockade of the Confederate ports; and "whereas by the acts and means aforesaid war exists between the Confederate States and the government of the United States, and the States and territories thereof, excepting the States of Maryland, North Carolina, Tennessee, Kentucky, Arkansas, Missouri, and Delaware, and the territories of Arizona, New Mexico, and the Indian Territory, south of Kansas; therefore the president is authorized to use the whole land and naval force of the Confederate States to meet the war thus commenced and to issue letters of marque under the seal of the Confederate States against the vessels of the United States." It was further provided in accordance with the Declaration of Paris (q.v.) that property of the enemy (except contraband of war) on board a neutral vessel should not be subject to seizure. In response to this declaration of existing war, a hundred applications for letters of marque were received from privateers, and troops crowded to the support of the new government with the same alacrity as in the North. On 21 May Congress adjourned to meet 20 July in Richmond, Virginia, now chosen as the permanent capital of the Confederate States. On 6 November an election was held under the permanent constitution for president and vice-president. As there was no opposition to Davis and Stephens, they were unanimously elected president and vice-president respectively by the electoral votes of the 11 Confederate States. They were to enter upon their offices 22 Feb. 1862, and to hold office for six years. Under the provisional government the president had appointed as members of his cabinet Robert Toombs of Georgia, secretary of state; C. G. Memminger of South Carolina, secretary of the treasury; L. P. Walker of Alabama, secretary of war; John H. Reagan of Texas, postmaster-general, and J. P. Benjamin of Louisiana, attorney-general. At the close of 1861 J. P. Benjamin had become secretary of war; S. R. Mallory of Florida, secretary of the navy; ex-Governor Thomas Bragg of North Carolina, attorney-general, and R. M. T. Hunter of Virginia had been appointed secretary of state, vice Toombs resigned. As the war went on, changes were made in the cabinet as follows: On the resignation of Mr. Hunter, Mr. Benjamin in 1862 held for a time the portfolios of state and of war, until Geo. W. Randolph of Virginia was made secretary of war. In the same year Mr. Randolph resigned and was succeeded by James A. Seddon of Virginia. Mr. Seddon resigned in the early part of 1865 and was succeeded by Major-General John C. Breckenridge of Kentucky. In 1864 Mr. G. A. Trenholm succeeded Mr. Memminger as secretary of the treasury. Attorney-General Bragg was succeeded by Thos. H. Watts and subsequently by George Davis of North Carolina.

The provisional Congress, which was unicameral, expired 15 Feb. 1862, and the Senate and House of Representatives elected under the permanent Constitution, met in Richmond 18 Feb. 1862. The members of this Congress were chosen from the most distinguished men of the South. "Of the 26 Senators, fourteen had been formerly members of the United States Congress, and in the lower house, out of 106, thirty-

three had also represented the South at Washington." Subsequently in the course of the war, the character of the Confederate Congress in general ability declined, many of the best men joining the army. One very necessary department of the new government it was found difficult to organize. This was the post-office. The position of postmaster-general was offered by President Davis to Mr. Ellet of Mississippi, and later to Mr. Wirt Adams of the same State; but both declined. Then J. H. Reagan of Texas, after twice refusing, was persuaded to accept the office. His reluctance was due to the fact that he knew the labor of organization would be heavy, and that if the mail facilities were inferior to those formerly furnished by the Federal government, there would be great dissatisfaction. But Mr. Reagan was thoroughly competent. He sent letters to Washington before the war began, and invited a number of clerks in the post-office department to take positions in the Confederate post-office. All but two accepted. With their help organization proceeded rapidly, and on 13 May Mr. Reagan announced that on the first of June the Federal service would cease and the Confederate service would begin. All postmasters were required by that date to render their final accounts to the United States government, and were invited to continue their duties under the Confederate government. The postmaster-general of the United States suspended the Federal service to take effect the same day. The permanent Constitution of the Confederate States required that the post-office should be self-sustaining after 1 March 1863. In 1859–60 the United States had conducted the post-office department in the States that were to form the Southern Confederacy at a loss of $1,941,425. Hence a radical change of management was necessary to meet the new requirement. Accordingly Postmaster Reagan persuaded the railroads to carry the mails at one half the former rate and to accept the bonds of the Confederacy in payment. He raised the rate on packages, newspapers, and letters, the postage on the last being fixed at five cents per half ounce for a distance of less than five hundred miles and ten cents for a greater distance. The franking privilege was abolished, and mail routes considered unnecessary were reduced in number or discontinued. As a result of these and other radical changes, the reports of the postmaster-general show that by the latter part of 1862 a surplus was obtained and from that time on there was a net annual increase of receipts over expenditures.

The various States of the Confederacy made no changes in the organization of their judiciary system, but the provisional constitution of the Confederacy provided that each State should be erected into a distinct judicial district, the judge having all the powers hitherto vested in the judges of the district and circuit courts; and that the several district judges together should compose the supreme bench, a majority of them constituting a quorum. During the year 1861 these district courts were organized, and they were continued under the permanent constitution. Congress, however, passed an act 31 July 1861, providing that the Supreme Court should be organized only under the permanent Constitution. Accordingly in the Congress that met in 1862, the establishment of a Supreme Court was discussed, but nothing was done until the following year. In January 1863, Senator Hill in the Senate said: "I think it high time the judicial department of the government be thoroughly organized; for it has been a limping concern long enough." Finally, on 18 March 1863, the Senate passed a bill to organize the Supreme Court. This bill was intended to carry out the provisions for a Supreme Court as found in the permanent Constitution; provisions that were practically identical with those of the Constitution of the United States. The bill provided for a Supreme Court of the Confederate States to consist of a chief justice and four associate justices, any three of whom should constitute a quorum. The court was to hold annually at the seat of government two sessions, and its appellate jurisdiction was limited to appeals from the Confederate district courts in the several States. Under a law passed by the provisional Congress (16 March 1861) it had been provided that the Supreme Court should, also, have jurisdiction in appeals from the State courts, "where was drawn in question the validity of a treaty or statute of, or an authority exercised under, the Confederate States; or where was drawn in question the validity of a statute of, or an authority exercised under any State, on the ground of their being repugnant to the Constitution, treaties, or laws of the Confederate States; or where was drawn in question the construction of any clause of the Constitution, or of a treaty, or statute, or commission held under the Confederate States." This law of the provisional Congress was significantly repealed in the Senate bill above mentioned. Whereupon the Richmond 'Examiner' declared that a Supreme Court, without the circuit feature of the Supreme Court of the United States, and acting simply as a court of appeals from the inferior tribunals of the Confederation, could do no mischief and might do much good. "But had the original law been allowed to stand, prophetic inspiration was not necessary to foresee that the career of the Southern Confederacy would have been but a pursuit of the catastrophe which overwhelmed the late Union." The Supreme Court as thus constituted, however, never saw the light of day after all. The Senate bill, after having been twice read in the lower house, was referred (20 March 1863) to the Committee on Judiciary, and no further mention of it is to be found. There has been much discussion as to the reason why the Confederacy failed to establish a Supreme Court. It seems clear that the reason was twofold. The experience of the South with the Supreme Court of the United States had, in the opinion of many, been disastrous to States rights. Moreover, at this time the military exigencies were much greater than the judicial; hence it seemed wise to defer the establishment of such a tribunal to a more peaceable season. The absence of a Supreme Court, however, had its natural result. The Federal district courts and even the State supreme courts interpreted the Confederate Constitution and in some instances, declared the acts of Congress unconstitutional. When a Confederate court in South Carolina decided that Congress had no right to tax State bonds, the war tax on bonds was not collected in that State. The existence of a court of final resort might have aroused antagonism among the sovereign States; but it seems to have been necessary.

The permanent Constitution of the Confederate States, while providing in almost the same words for the same division of powers, differed from that of the United States in some important details. If a good case of infringement of copyright could be made out against the South, it is to be remembered that that section could claim a large share in the framing and wording of the original instrument. Nor did the South desire to draw up a new constitution. The intention was rather to make explicit certain states-rights principles that were held to be implicit in the old constitution, and to make some additions which it was believed the experience of seventy years had shown to be necessary. Only the more important of the changes can be given here. In the preamble, instead of the ambiguous "we the people of the United States," is found "we the people of the Confederate States, each State acting in its sovereign and independent character in order to form a permanent Federal government." As an additional qualification of electors, it is declared that "no person of foreign birth, not a citizen of the Confederate States, shall be allowed to vote in State or Federal elections" (a restriction upon the previous powers of the States). Further changes were that any judicial or other Federal officer, resident and acting solely within the limits of any State, may be impeached by a vote of two thirds of both branches of the legislature thereof. Congress may by law grant to the principal officer in each of the executive departments a seat upon the floor of either house, with the privilege of discussing any measure appertaining to his department (an excellent arrangement which, though practised under the provisional government, was never put into force by the Congress). The president may approve any appropriation and disapprove any other appropriation in the same bill. All taxes or importations shall be for revenue only; not to foster any branch of industry. The "general welfare" phrase of the Federal Constitution is omitted: taxes are to be laid for "the common defence and to carry on the government." The power of Congress to provide for internal improvements is limited. Congress is denied the right to emit bills of credit (legal tender). No bankrupt law must be retroactive. The African slave trade is forbidden. Taxes may be laid on exports by a two thirds vote of both houses. Except in certain specified cases Congress can appropriate no money from the treasury without a vote of two thirds of both houses. A State may lay a duty on the tonnage of sea-going vessels for the improvement of its rivers and harbors. When a river divides two or more States, they may enter into compacts with each other to improve the navigation thereof. The president and the vice-president are to hold their offices for six years, but the president is not to be re-eligible. The president may at his pleasure remove the principal officer in each of the executive departments. All other civil officers of the executive department may be removed by the president or other appointing power when their services, etc., are unnecessary, or for incapacity, dishonesty, etc., and the removal with the reasons therefor shall be reported to the Senate. Citizens of any State shall have the right of transit and sojourn in any State of the Confederacy with their slaves or other property, and the right of property in said slaves shall not be thereby impaired. The Confederate States may acquire new territory (a clause much desired by Jefferson in the original Constitution), and in all such territory the institution of negro slavery, as it now exists in the Confederate States, shall be recognized and protected by Congress and by the territorial government. Amendments to the Constitution are not to be made through the initiation of Congress as in the old Constitution; but upon the demand of any three States, legally assembled in their several conventions, the Congress shall summon a convention of all the States to consider such amendments as may be proposed by the States. If these amendments are agreed on by the convention and are ratified by two thirds of the States acting through their legislatures or conventions, they shall form a part of the Constitution. Finally the ratification of five States shall be sufficient for the establishment of this Constitution between the States so ratifying the same. Southern writers have very generally maintained that every point which differentiated this Constitution from its predecessor was an improvement on the latter. As to the correctness of this claim jurists will differ accordingly as they approve or disapprove of loose confederacies. Under this Constitution the Confederate government levied taxes, negotiated loans, raised armies, and for several years carried on a terrible conflict. The test of the worth of a constitution, however, is its working in times of peace as well as in times of war. If this Constitution had been tested in times of peace, it is likely that it would have shown the fatal tendency of all confederacies to disintegrate when no external pressure holds them together. Nor will it be maintained that in time of war the Constitution proved itself a very efficient instrument. The States, endowed with fresh "sovereignty," were jealous of their rights and sometimes nullified the Constitutional acts of the government. For such cases the Constitution spoke no word of coercion. On the other hand, while the government was clearly a Confederacy, the exigencies of war compelled a concentration of power into the hands of the president and his cabinet which grew into a military despotism. Congress protested, but grew feebler as the conflict became more desperate. There was friction between the legislature and the executive, and between both and the States. Among the acts of the government that caused particular dissatisfaction may be mentioned the repeated suspension of the writ of *habeas corpus* down to 1 Aug. 1864; though Dr. Schwab has shown that this suspension was carried out with less stringency in the South than in the North. Other grievances were the severe conscription acts, the impressment of supplies for the army at fixed prices, the constant interference with interstate commerce, and the issue of vast quantities of irredeemable paper money. This currency was never formally made legal tender as was done in the North, but it was practically forced upon those who sold supplies to the government. All these measures which may easily be paralleled in history, and which seem to have been rendered necessary by the dire necessities of the war, caused distress and met with opposition in some of the States.

The blockade of the Southern ports by the navy of the United States was so strict that the

wealth of the South, its cotton and other crops, could not be sent abroad, save at fatal risk, in exchange for the munitions of war. In the early stage of the conflict there had been no desire to export the cotton. The strange delusion that "cotton is king" was so widespread that it was thought possible to compel England to recognize the Confederacy by withholding from her the great staple. When, however, the fallacy of this embargo was as clearly seen as once before in our history, both the Confederate government and some of the State governments utilized the blockade runners to send cotton abroad to exchange for the thousand and one things which the South, from lack of industrial development, was unable to supply for the support of the army. But the help thus obtained was infinitesimal in comparison with the needs, and the government had to fall back upon the sacrifices of devoted men and women. "The Southerners' sacrifices," says Dr. Schwab, "far exceeded those of the Revolutionary patriots. The Southern cause evoked as much devoted loyalty as has been called forth by any cause in history; and that cause was supported at a cost greater than in any similar conflict." Yet, in 1865, after four years of terrible struggles, it was seen that the Confederacy was tottering to its fall. It is generally held that the most potent factor in its ruin was the effective blockade of its ports, cutting it off from the only markets in which its products were available. Doubtless this is true. The Confederacy, with a debt of $1,400,000,000, was now hopelessly bankrupt. But it must also be remembered that the crop of men was beginning to fail. While the North was able to increase its active army each year, and even draw from its foreign population 720,000 men, the South in 1865 was reduced to the desperate resource of passing a law to draft the slaves into military service. "The total military population of the South," says Dr. Woodrow Wilson, "was 1,065,000, of which 900,000 went into the army for at least three years' service. The losses were about 300,000. At the end, 175,000 surrendered to armies of 980,000." It is idle, therefore, to attribute the downfall to the errors of the president and his cabinet or the deficiencies of the constitution. In accumulated wealth, in industrial development, in ships, and in men, the South, in a prolonged struggle, was no match for its powerful adversary. The logic of facts pointed to a united country. See CONFEDERATE STATES OF AMERICA; U. S.— CAUSES OF THE CIVIL WAR.

JOHN R. FICKLEN,
Professor of History, Tulane University.

37. United States — The Political Events of the Civil War. The Civil War in America began by the Confederate attack on Fort Sumter, 12 April 1861. The Secession movement had begun upon Lincoln's election; war had become inevitable at the time of his inauguration. Two authorities — two sovereignties — were claiming independent jurisdiction over the same area, and, after that, it was only a question of time when these would meet in armed conflict. All effort at further compromise had failed. The time for saving the Union by conciliation and concession had passed. The United States government had now to decide either to recognize the Southern Confederacy as an independent power in its own limits, or to vindicate the national authority by force of arms. There was no longer any middle ground.

The issue upon which Lincoln had been elected was the restriction of slavery to the area of the Slave States. The first purpose of the new President upon coming into power was to restrict the area not of slavery but of secession. There were still thousands of Union men, especially in the border States and among Mr. Lincoln's party opponents in the North, to whom "coercion" was odious; who thought that military force as a means of holding the States together was not only useless but pernicious; who believed, or professed to believe, that the national authority could never be successfully asserted by the bayonet and the sword against such a formidable revolution as that represented by the confederated slave States; that compromise and conciliation were still the only hope of holding the border States; that the Union, now destroyed because of abolition fanaticism and folly, could be restored only by dividing public opinion in the South, and by waiting until Southern men could be induced to accept Federal appointments and until the civil machinery of the Federal government could again be put in motion in the Southern States. Lincoln recognized this body of conservative Union opinion, and whatever of genuine loyalty to the national cause there was in it he wished not to antagonize. He would bring every possible man, every ounce of opinion, to oppose secession. He would, if possible, unite the North, divide the South, and save the border States. For this reason Mr. Lincoln's inaugural address was quite conciliatory in its attitude towards slavery and the South. The platform of his party committed him both to "the preservation of the Union and the maintenance of the right of each State to order and control its own domestic institutions according to its own judgment exclusively." In his inaugural address Lincoln reiterated this sentiment of his party platform, and, quoting one of his former speeches, he declared, "I have no purpose, directly or indirectly, to interfere with the institution of slavery in the States where it exists. I believe I have no lawful right to do so, and I have no inclination to do so."

In this address Lincoln took no positive anti-slavery stand. He spoke in favor of the return of the fugitive slave, and he in no way urged the cause — the non-extension of slavery — for which he had been elected. In this Lincoln merely recognized, as any statesman should have done, that the paramount issue confronting the nation had changed since his election in November. Then it had been the extension of slavery; now it was the preservation of the Union, the unity and integrity of the nation itself. Therefore, on 4 March 1861, Lincoln stood ready for the sake of avoiding war and disunion, to subordinate, so far as it was morally possible, his own and his party's anti-slavery purposes. He would not surrender the principle for which he had been called into power and his party into being. But he declared his willingness to accept an irrevocable amendment to the Constitution prohibiting the national government from ever interfering with slavery in the slave States; and he assured the people of the South that they would not be assailed, and that they could have no conflict unless they themselves became the aggressors. But the

President declared that, despite the ordinances of secession, he regarded the Union as unbroken, and that, as the Constitution and his oath of office bound him to do, he would faithfully "execute the laws of the Union in all the States"; and this he would continue to do unless, and until, his "rightful masters, the American people, shall withhold the requisite means or in some authoritative manner direct the contrary." "The power confided to me," he said, "will be used to hold, occupy and possess the property and places belonging to the government, and to collect the duties and imposts; but beyond what may be necessary for these objects, there will be no invasion, no using of force against or among the people anywhere."

Here was clearly drawn the political issue of the Civil War — national unity and the enforcement of the national authority against disunion and the right of secession. It was not possible for the national authority to recognize this issue — its own right to exist — as within the field of negotiation, and the attempt of the Confederate government to secure recognition by opening diplomatic relations at Washington was repelled.

If the national government intended to maintain its authority and to "execute the law in all the States," there was nothing for the South to do but to yield or fight. The South's answer was the defiant attack on the national authority at Sumter. The call for 75,000 three-months' volunteers and the uprising of the national spirit followed. Party issues were forgotten, and the great body of the Democratic voters in the North, following their leader, Mr. Douglas, rallied patriotically to the support of the government, as did also many Breckenridge Democrats. (See DOUGLAS; BRECKENRIDGE, J. C.) In the proclamation calling for volunteers Lincoln commanded the insurgents to disperse within 20 days, called Congress into extraordinary session for 4 July 1861, and announced that the object of the military force was to repossess the forts and places seized from the Union. The time limit of three months for the troops was made necessary by the Act of 1795, as this law authorized the use of the militia "until the expiration of three months after the commencement of the then next session of Congress."

Virginia's secession followed immediately (17 April) upon Lincoln's call for troops, upon the plea of resisting "coercion" and "invasion." Tennessee and Arkansas soon afterward followed Virginia and joined the Confederacy, but the attempt to carry Missouri and Kentucky into the secession movement was foiled by the co-operation of the national government with the Union forces in those States. After the bombardment of Sumter and before the meeting of Congress (12 April–4 July 1861), President Lincoln assumed extraordinary war powers. (See UNITED STATES — THE PRESIDENT'S OFFICE.) He proclaimed a blockade of Confederate ports (19 and 27 April); he increased the forces of the regular army and navy (3 May) by his mere executive order, and he authorized his military subordinates in several places to suspend the writ of habeas corpus. (See HABEAS CORPUS.) The orders of blockade had been evoked by the purpose of the Confederate government, indicated by Mr. Davis' letters of marque and reprisal (17 April), to use its ports for fitting out privateers to prey upon the commerce of the United States. The other measures of the President were held to be justified by the emergency. (See PRIVATEERING; BLOCKADE; BELLIGERENT.) Upon the assembling of Congress these executive acts were approved, and, as far as indorsement and congressional resolution could do so they were legalized; and Congress proceeded to make military and financial provision for a vigorous conduct of the war.

Slavery had been the primary cause of secession and war. But slavery was not the issue on which the men of either side were called upon to fight. The cause for which the North rallied to arms was union and nationality; the cause of the South was independence and the rights of the States. Both disclaimed slavery as the cause of arms. But slavery, as it was the everlasting cause of strife before the war, was the chief cause of political difference during the war; and the relation of the war to slavery is the most important point of view from which the political events of the war are to be studied. To what extent should the war be distinctly an anti-slavery war and be made an instrument of emancipation? To what extent should the war be conducted solely to preserve the Union, and to restore national authority without disturbing in any way the "domestic institutions" of the States? On these questions Mr. Lincoln was constantly subject to pressure in opposite directions. The conservatism in his nature, and the conservative wing of his party required that he should not assume a more radical and aggressive anti-slavery attitude than the public sentiment of the country would support; while his party opponents were vigilant and quick to denounce and oppose him for converting and degrading the war from a noble effort for the Union into a mere abolition war for the "nigger." On the other hand the radical anti-slavery forces were constantly urging him to strike at the real strength of the rebellion by striking at its cause. This wing of the Union forces held with Sumner that the "rebellion was but slavery in arms."

Congress attempted to define the purpose of the War and its relation to slavery in the famous Crittenden resolution of 22 July 1861, which was passed in both Houses by an almost unanimous vote. It was declared that the War was forced upon the country by the disunionists of the South; that "the War is not waged upon our part for any purpose of conquest or subjugation, nor for the purpose of overthrowing or interfering with the rights or established institutions of those States; but to defend and maintain the supremacy of the Constitution and to preserve the Union with all the dignity, equality, and rights of the several States unimpaired; that as soon as these objects are accomplished the War ought to cease." See CRITTENDEN COMPROMISE.

This is the platform upon which the conservative Democracy of the North insisted that the War should be conducted, and for any departure from this policy they were ready to denounce the administration and displace it from power. In saving the Union by war the administration must not be allowed to violate the Constitution in any way nor in any way interfere with the rights of the States or the legal status of the slaves. The political and party

struggles of the Civil War focus themselves largely about this issue. On the one side were those of a conservative, purely Union-saving purpose, who were disposed to demand that the war be conducted strictly according to the forms and canons of the Constitution. Among these were probably many who cared more to save slavery and the rights of the States than to save the Union. On the other hand were the radical anti-slavery men who were determined that, while the war should be for the Union, it should not cease until emancipation should be secured. Among these were many who cared more to destroy slavery than to save the Union. Lincoln, as we shall see, occupied middle ground between these opposing extremes.

In the gradual but constant progress of the Administration toward an anti-slavery policy—in its movements from an attempt to save slavery and the Union together to the policy of emancipation and the reconstruction of a New Union wholly free, there are certain notable features and landmarks. Among these we may notice first, the attitude of the Administration toward military emancipation.

As early as 25 May 1861, Gen. Benjamin F. Butler in command of the Union forces about Fortress Monroe, gave the first indication of a military method of emancipation. He refused to return to their masters slaves coming within his lines, on the ground that they had been used in aid of the rebellion, in the erection of batteries and other works; that if slaves were property, as the South had always contended, they were therefore properly "contraband of war"; that this slave property, useful for military purposes, might as well be used in aid of the United States as against it; that masters in arms against the Constitution were barred from claiming the enforcement of their constitutional rights by their belligerent opponents, and that only slaves of loyal owners should be returned. Butler put this "contraband property" to work for his own military purposes. Public sentiment of the North applauded Butler's course although he was not promptly and heartily sustained by the administration.

The Confiscation Act (6 Aug. 1861), passed within a fortnight of the Crittenden resolution, indicated the beginning of a change of policy toward slavery on the part of Congress. This is to be regarded as a military measure. It pronounced forfeiture of all slave property used in aid of insurrection and thus it substantially, under another form, endorsed Butler's contraband order. Mr. Lincoln was not pleased with the confiscation act, as he feared it would alienate the border States which he was diligently trying to conciliate. He wished Congress not to meddle with the slavery question, but to leave that problem to the military authorities. On 8 August 1861, two days after the passage of the Confiscation Act, Mr. Lincoln's Secretary of War, Mr. Cameron, wrote to Butler, who was pressing for further instructions: "It is the desire of the President that all existing rights in all the States be fully respected and maintained; in cases of fugitives from the loyal slave States the enforcement of the Fugitive Slave Law by the ordinary forms of judicial proceedings must be respected by the military authorities; in the disloyal States the Confiscation Act of Congress must be your guide." The slave rights of loyal masters in disloyal States were to be safeguarded as far as possible. This policy indicates Lincoln's conservatism at the beginning of the war, and his regard for vested rights whenever the slavery question appeared. In pursuance of this line of policy Lincoln tacitly endorsed Halleck's order returning fugitives and protecting slave property, while he did not hesitate to overrule and set aside General Frémont's order (30 Aug. 1861) in Missouri emancipating the slaves of all persons who had taken up arms against the United States. On 11 September 1861 Lincoln overruled Frémont and on 19 May 1862 he revoked and repudiated a similar order of General Hunter for the Department of the South. Lincoln declared that "no commanding officer shall do such a thing upon my responsibility without consulting me." Chase and other anti-slavery supporters of the Administration urged Lincoln to let Hunter's order stand, but the President was afraid it might alienate support from his policy of compensated emancipation which he was then urgently pressing upon the representatives from the border States. In his annual message of December 1861, Lincoln had expressed his purpose still "to keep the integrity of the Union prominent as the primary object of the contest." By this time Congress, aroused by the sad losses of the War and the formidable power of the rebellion, refused to reaffirm the Crittenden resolution of the previous July. This refusal seemed to indicate that other objects of the war were in view besides the suppression of the insurrection.

By the spring of 1862 Lincoln's policy on slavery may be said to involve gradual emancipation by the consent and co-operation of slave-holding States; national aid for the compensation to owners, and the colonization of the negroes made free by this policy and by the operation of the confiscation act of Congress. Up to the time of the rejection by the border slave States of Lincoln's policy of compensated emancipation and its failure in consequence, anti-slavery sentiment and purpose may be said to have been more radical and outspoken in Congress and the country than in administration councils. But after he dismissed his plan of compensated emancipation Lincoln determined upon emancipation in another way. This was emancipation as a war measure, by military power. He made known this purpose to his Cabinet, as early as 22 July 1862. It was determined in the Cabinet council not to make public announcement of this policy until a more favorable military situation could be secured. Lincoln's pro-slavery orders, and his policy that seemed so much like timid conservatism, led the radical Republicans and anti-slavery men to continue their pressure and hostile criticism. The effort to induce Lincoln to take a more decided stand against slavery brought out the celebrated Greeley-Lincoln correspondence. Greeley sent to Lincoln and published in his *Tribune* (20 Aug. 1862) his "Prayer of Twenty Millions." This letter created a distinct impression upon the country and is a document of historical importance. "All who supported your election," said Greeley, "and desire the suppression of the rebellion are sorely disappointed by the policy you seem to be pursuing with regard to the slaves of rebels." The editor urged Lincoln to execute the laws especially the confiscation act, and he censured the President as disastrously remiss with regard to the emancipation provision of that

act. "You are unduly influenced by the counsels, the representations, the menaces of certain fossil politicians hailing from the border slave States; timid counsels in such a crisis are calculated to prove perilous and probably disastrous. We complain that the Union has suffered, and is now suffering, immensely from your mistaken deference to rebel slavery."

Lincoln's famous reply to Greeley contains in the most succinct form a statement of his war policy and his political attitude toward slavery. "I would save the Union." This Lincoln announced as his constant end and aim.

> If there be those who would not save the Union unless they could at the same time save slavery, I do not agree with them. If there be those who would not save the Union unless they could at the same time destroy slavery, I do not agree with them. My paramount objection in this struggle is to save the Union, and is not either to save or to destroy slavery. If I could save the Union without freeing any slave, I would do it, and if I could save it by freeing all the slaves, I would do it; and if I could save it by freeing some and leaving others alone, I would also do that. What I do about slaves and the colored race, I do because I believe it helps to save the Union; and what I forbear, I forbear because I do not believe it would help to save the Union. I shall do less whenever I shall believe what I am doing hurts the cause, and I shall do more whenever I shall believe doing more will help the cause. I shall try to correct errors when shown to be errors, and I shall adopt new views so fast as they shall appear to be true views. Such is my purpose according to my view of official duty. I intend no modification of my oft-repeated personal wish that all men everywhere might be free.

In September 1862 Lincoln publicly announced his policy of emancipation. (See EMANCIPATION.) Notwithstanding this forward step, momentous in its ultimate, if not in its immediate, results, dissatisfaction with Lincoln among anti-slavery men continued and a concerted movement arose within the Republican party to supersede Lincoln in the leadership. The dissatisfied Republicans sought to secure the nomination of Chase or some other more radical anti-slavery man for the Presidency. When this fell through, the more radical spirits secured an independent convention and the nomination of Frémont against Lincoln in 1864, and this indicated a serious division within the Union-Republican party. On the other hand conservative men in the Administration, like the Blairs, and others sincerely in favor of the war for the Union, opposed the Emancipation Proclamation on the ground that it would lose the fall elections, alienate support from the war and endanger its success; while the Democratic opposition in the North were seizing upon all the anti-slavery measures of Congress and the President as material for a political campaign against the Administration, on the ground that the war for the Union was being turned into a war for abolition.

The anti-slavery purposes of the war were making headway. The Democratic opposition to the war policy of Mr. Lincoln arraigned the Administration on various indictments. The refusal of Congress to re-affirm the Crittenden Resolution; the abolition of slavery in the District of Columbia (April 1862); the abolition of slavery in the Territories (June 1862); the second Confiscation Act of 17 July 1862, providing for the emancipation of the slaves of rebels and their abettors, and for the employment of such freedmen in the suppression of the rebellion as the President might direct; the military annulment of the Fugitive Slave Act by the contraband policy and by the act (13 March 1862) forbidding military officers from arresting and returning fugitive slaves; the scheme for compensated emancipation, because of its enormous expense; the emancipation proclamation, as tending to incite slave insurrection; he military organization of the blacks (July 1862), as tending to equalize the white soldiery with the negro; the recognition of Liberia and Haiti; the enlargement of legal privileges for the negroes where they were under national jurisdiction — all these measures were denounced by the opponents of the Administration and were used to prove the aholition and unconstitutional character of the war.

On account of these anti-slavery measures all those were arrayed in the political opposition whose race prejudices against the negro were pronounced; who hated the New England abolitionists as much, or more, than they did the "fire-eating" secessionists; who believed in slavery, or were indifferent to its evils; who thought that in the conduct of the war the wrongs of the negro should not be taken into account and that the interests of the white race alone should be considered.

Another noticeable factor in this opposition were the constitutional legalists, who were insistent upon holding the conduct of the war strictly to the forms of the law and the constitution. These made the preservation of civil liberty and the rights of the individual their special cause and chief concern. They were more strenuous to preserve these individual rights than they were to preserve the Union, and they contended that the Union could not be preserved, or need not be, if the Constitution and the law were violated and disregarded. That which claimed their obedience and loyalty, they asserted, was not a person invested with office, nor an idea of public necessity, nor an imaginary national life apart from the life of the Constitution. "What the Constitution ordains or authorizes, *that* is the public necessity, *that* is the national life, *that* is the supreme civil obligation." This was the position taken by able and conservative lawyers and leaders like George Ticknor Curtis and Horatio Seymour, who opposed the conduct of the war because of what they considered the high-handed usurpations of power by the war authorities. They felt that loyalty required them to be loyal to the reserved rights of the States as the supreme law of the land as well as to the powers vested in the general government; that loyalty bound them to safeguard the rights of persons and property guaranteed by the Constitution to every citizen, as well as to support a war to crush insurrection. With these feelings and principles they opposed the Administration on account of the suspension of the writ of habeas corpus, on account of arbitrary arrests, and the suspension of free assembly, free speech and free press. Certain newspapers had been suppressed (the New York *News*, the New York *Journal of Commerce*, Chicago *Times*, Brooklyn *Eagle*, and others) on the ground that they were encouraging the rebels to persevere in their resistance, by expressing sympathy with them, by urging the duty of acceding to their demands, and by expressing dissatisfaction with the policy of employing force to overcome them. These papers were constantly denouncing as "an unholy war" the war "in defence of our country, its institutions and most sacred rights, and carried on solely for the restoration of the authority of the government." This kind

of party opposition to the war was what Lincoln called "the fire in the rear." See HABEAS CORPUS; MILLIGAN DECISION.

Some of these opponents of the war were disloyal factionists who at heart were in sympathy with the South, and who preferred disunion to the political and military success of the Administration. These were the "Copperheads" of the North. Clement L. Vallandigham, of Ohio, was one of the most distinguished and extreme representatives of this group. He was arrested at Mount Vernon, Ohio, in May 1863, upon a charge of "publicly expressing sympathy for those in arms against the government of the United States, and declaring disloyal sentiments and opinions with the object and purpose of weakening the powers of the government in its efforts to suppress an unlawful rebellion." He was found guilty by a military tribunal and sentenced to close confinement—a sentence which President Lincoln commuted to banishment to the enemy's lines. The Democrats of Ohio officially protested against these proceedings and Lincoln informed them that Vallandigham had been arrested because "he was laboring with some effect to prevent the raising of troops, to encourage desertions from the army, and to leave the rebellion without any adequate military force to suppress it." While in exile Vallandigham was nominated by the Democrats for the Governorship of Ohio and was defeated by the unprecedented majority of 100,000 votes.

Elsewhere in the North Democratic leadership, while its purposes and principles were in most respects the same as those of Vallandigham, was more moderate and restrained, and, under the direction of men whose loyalty to the Union was undoubted, the Democratic successes in the elections of 1862 and 1863 were very pronounced. The military losses and disasters, the newness of the emancipation policy, the unexpected extension of the war, the unfriendly attitude of foreign powers, the growing belief that the Union could not be restored by war, the vigor of the Democratic attack in the rear—all these were factors in causing the loss of the fall elections in 1862. This was interpreted as a vote of want of confidence in the Administration, and it is probable that if Lincoln had been a candidate for re-election in 1862 he would have been defeated.

Another cause of opposition is to be taken into account after the summer of 1863. This was the Conscription Act and the effect of the draft. Although what seems now like decisive military successes had come to the national arms in July of that year (Gettysburg, Vicksburg) a successful end of the war seemed distant; and the people were becoming very weary of waste, bloodshed, and battle. They were sighing for peace. But the burdens of the war were to be still further increased. On 3 March 1863 Congress passed a Conscription Act authorizing a draft of 300,000 men. Certain provisions of the act led to disagreements as to quotas between Federal and State authorities, and a clash seemed imminent. A $300 clause allowed a man who could pay that sum to be released, while one who could not must go into the ranks. With this discrimination in favor of the rich and against the poor, a great deal of popular prejudice and opposition were aroused by the party opponents of the administration against the draft; and the draft riots in New York, in July 1863, resulted in serious loss of life and property. Governor Seymour, of New York, requested President Lincoln to suspend the enforcement of the draft in that State, and it was intimated to Secretary Stanton that this act could be enforced only by the co-operation and consent of the State authorities. Stanton held that the issue of the Civil War was the enforcement of the national authority by its own power without dependence upon the consent of the State.

Added to the excitement and opposition aroused by the draft came the President's Proclamation of 15 Sept. 1863, suspending the privilege of the writ of habeas corpus throughout the United States in all cases where persons were held by the civil, military, or naval authorities under the orders of the President, as "aiders or abettors of the enemy." This proclamation followed the grant of power conferred by the act of 3 March 1863, by which Congress, as it had previously legalized previous suspensions of the writ, authorized the President to suspend this guarantee of personal liberty during a period of Civil War throughout the whole United States. Under this act military arrests, without civil warrants, and trials by military commissions continued in various parts of the North. The critics of the administration held that the purpose of this policy was to consider all political opponents of the administration as "aiders and abettors of the enemy," and they feared that all political discussion and criticism were to be suppressed by a military absolutism. (See HABEAS CORPUS; MILLIGAN DECISION.) Freedom of the mails had also been denied to hostile matter, or such as might instigate others to co-operate with the enemy. (See Report of the Judiciary Committee of the House, 20 Jan. 1863.)

Thus, with divisions within the ranks of the Union-Republican party, with the country longing for peace, with many factors and elements arousing and uniting the opposition, there was danger that the Union-Republican party would be defeated by the party calling itself the "Conservative-Union Party." This party had nominated Gen. George B. McClellan, one of Lincoln's deposed generals, on a peace platform, demanding peace after "four years of failure to restore the Union by war." Their policy was to restore the Union by stopping the war, by armistice, negotiation, convention,—by some diplomatic agreement to which both parties might agree, and that fighting should cease until an arrangement could be adjusted. They would substitute negotiation for subjugation. Presumably, in the mind of this party, if negotiation failed disunion was preferable to a continuance of the war. Their great political error was in their failure to perceive that it was forever too late, on account of the state of public sentiment both North and South, to secure a restoration of the old Union under the old Constitution. While there was any hope left to them in the field the South would never consent to a restoration of the Union; and when their military defeat, after Atlanta, Nashville, and Sherman's march to the sea, became a foregone conclusion, then the terms of settlement and reunion were to be determined only by the national will. But it was in the

face of the situation before these military victories in the latter part of '63 and the early part of '64, with the cry for peace seemingly almost irresistible, that Andrew, Sumner and other radical anti-slavery men, felt that the most important thing to do was to rescue Lincoln from the peace influences that seemed to surround him; from those who were tempting or pushing him to an unworthy or disgraceful offer of compromise with the leaders of the rebellion. These radical spirits wished to prevent Lincoln from offering the South peace merely on the basis of a restored Union without emancipation.

There were other political phases of the war on which the opposition joined issue with the administration. The conduct of foreign affairs was made the subject of severe animadversion. In the settlement of the Trent Affair it was charged that Seward had been subservient to Great Britain and had sacrificed the national honor. In his tolerance of the French intervention in Mexico he had sacrificed the traditional policy of the Monroe Doctrine (q.v.). In domestic affairs the financial and revenue policy of the government were brought into adverse review; while the creation and the admission of West Virginia were denounced as an unconstitutional act of spoliation and dismemberment of the "Old Dominion."

In the long session of 1861–2 Congress passed a number of measures which, even in this brief review, should not go unmentioned. It authorized the President to take possession of the railroad and the telegraph when the public safety required it; passed a Homestead act; established a Department of Agriculture; passed the act to donate public lands to States and Territories for the purpose of founding agricultural colleges; authorized the construction of a railroad to the Pacific Ocean, aiding the road in land and government bonds; and, finally, created the comprehensive scheme of internal taxation. The famous revenue act of 1 July 1862, developed the excise tax in a manner unheard of in this country before. Writers have frequently applied to this system of internal revenue Sydney Smith's humorous account of British taxation in 1820: "Taxes upon every article which enters into the mouth, or covers the back, or is placed under the foot; taxes upon everything which it is pleasant to see, hear, feel, taste, or smell; taxes upon warmth, light and locomotion; taxes on everything on earth and the waters under the earth." Every visible commodity or transaction was taxed. Licenses were required of all distillers and brewers, manufacturers, wholesale and retail dealers, of men in all kinds of business,— proprietors of theatres, of jugglers and circuses, of lawyers, physicians, surgeons, and dentists. The act imposed 20 cents per gallon on spirits, $1 per gallon on malt liquors, a heavy tax on tobacco and cigars, carriages, yachts, billiard tables, and plate; on slaughtered hogs, cattle and sheep; on passports, legacies, and receipts from railroads, steamboats, and toll-bridges; on dividends from banks and trust companies; and 3 per cent was assessed on incomes less than $10,000 and 5 per cent on incomes over $10,000, with an exemption of $600. Stamp duties on all kinds of paper were imposed. The income tax was regarded as a form of excise, not a direct tax. (See Income Tax.) This Revenue Act and Legal Tender Acts under which $450,000,000 of legal tender notes, commonly called greenbacks, were issued, were the most important pieces of fiscal legislation during the war. See Legal Tender.

After the military successes of the Union arms in the fall of 1864 and after the re-election of Lincoln, all hope of an independent Confederacy passed away. It was then only a question of endurance, of "fighting to the last ditch." The peace conferences had come to naught, and the demands for an armistice were no longer a menace to the complete triumph of the national arms. (See Hampton Roads Conference.) Already, in 1864, the 13th Amendment and the various plans of Reconstruction had begun to receive the attention of Congress, and it is to these subjects after the fall of 1864, that the student of the political history of the war should give his attention.

Bibliography.— McPherson, 'History of the Rebellion'; Rhodes, 'History of the United States from the Compromise of 1850,' Vols. III., IV.; Schouler, 'History of the United States'; 'Life of Lincoln,' by Hay and Nicolay, by Morse, by Arnold, by Tarbell, by Barrett, by Hapgood, by Herndon; 'Lincoln's Complete Works'; Wilson, 'Slave Power'; Stanwood, 'History of the Presidency'; Pollard, 'Lost Cause'; Davis, 'Rise and Fall of the Confederate Government'; Stephens, 'War Between the States'; Johnston and Woodburn, 'American Orations'; Blaine, 'Twenty Years of Congress'; Greeley, 'American Conflict'; Cox, 'Three Decades of Federal Legislation'; Burgess, 'The Civil War and the Constitution'; Thayer, 'Cases in Constitutional Law'; Hart, 'Source Book,' and 'American History Told by Contemporaries'; Lives of Chase, Seward, Stevens, Sumner, Wade, Morton, Andrew; Wilson, 'History of the American People,' and 'Division and Reunion'; 'Cambridge History of the United States'; Smith, 'Political History of Slavery'; Williams, 'Negro Race in America'; 'Congressional Globe.'

James Albert Woodburn,
Professor of History, University of Indiana.

38. United States — Finances of the (1861-1903). In the winter of 1860–1 the finances of the federal government were most discouraging. Secession was already under way; national credit was depressed; and executive efficiency was slowly disintegrating. There was little confidence that the Republican party which had carried the election in November 1860, would be able to weather the approaching storm. Some strength was shown at the close of the session by the passage of a new tariff law known as the Morrill Tariff, in which rates were slightly advanced. Lincoln took office 4 March 1861, and appointed Salmon P. Chase secretary of the treasury. On 15 April the troops were called out to put down the rebellion, and the country entered upon a four years' war which tried the financial system to the utmost, necessitated radical methods of financiering, burdened the country with an enormous debt, and raised taxes to a permanently high level. In brief, during the fiscal years, 1862–5, expenditures were $3,348,000,000; taxes $667,000,000, and loans $2,622,000,000. Loans were nearly four times as large as taxes. In the spring of

1861 it was not supposed that the war would last long, and consequently the legislation of July and August was not designed to increase taxes in any considerable degree. A loan of $250,000,000 was authorized, some increase was made in the tariff schedules, and an income tax was levied. Under the authority of the loan act the treasury department endeavored with the assistance of local banks to borrow $150,000,000 by the issue of three year treasury notes, bearing 7.3 per cent interest, since known as the seven-thirties. The banks responded with energy, but owing to the restrictions of the independent treasury law requiring all payments to the government to be made in specie, they could not carry the burden, and in December suspended specie payments. The treasury department was forced to follow their example. By the act of 25 Feb. 1862, a comprehensive loan act was passed, and authority given for the issue of $150,000,000 non-interest legal tender treasury notes. There was much opposition to making the notes legal tender, but the issue was justified in the debates on the ground of necessity,—"necessity to meet the immediate obligations of the government; necessity to give currency to treasury notes; necessity to provide money which would in turn purchase bonds." Two further issues, each of $150,000,000, were made by the acts of 11 July 1862, and 17 Jan. 1863. In addition to these non-interest notes, the legal tender quality was attached to some of the other short-term treasury notes. Other forms of treasury indebtedness were demand notes, certificates of indebtedness, temporary loans and fractional currency. Of the total amount borrowed, $1,045,000,000 was in the form of long-term loans; $890,000,000 in interest bearing notes; $458,000,000 in non-interest bearing notes, and $208,000,000 in temporary loans.

In selling long-term bonds Chase kept four objects in view: (1) moderate interest; (2) general distribution; (3) future controllability; and (4) incidental utility. Chase objected to selling bonds at a discount, or to offering more than six per cent interest. After the suspension of specie payments the legal treasury tender notes, or greenbacks, depreciated greatly in value; as they were, however, receivable in the purchase of bonds and as the bonds bore interest in gold, the return to the purchasers, as measured in gold, was far greater than the nominal rate of interest would indicate. Under the conditions, therefore, the market for bonds constantly broadened. To secure a wider distribution in the investment of government securities, an agent, Jay Cooke (q.v.), was employed with an extensive system of sub-agents to place the bonds in every section of the country. Chase was also opposed to making long loans and consequently reserved the right to the government of redeeming bonds after five or ten years. This gave rise to securities known as five-twenties and ten-forties, running for 20 or 40 years, but redeemable at the option of the government at the shorter period. In order to make a wider market for bonds, as well as to reform the currency system on a national basis, the national banking system was organized in which circulation is based upon the deposit of bonds.

In July 1862, a more vigorous policy of taxation was adopted; internal revenue taxes were imposed upon fermented liquors and tobacco; upon occupations, auction sales, carriages, yachts, billiard tables and plate; upon slaughtered cattle, transportation agencies, banking and insurance companies, advertising, incomes, and legacies. At the same time tariff duties were increased to compensate domestic industry for the internal revenue duties. Internal revenue receipts did not meet expectations, and in 1864 a second expansion of the revenue policy was made. The internal revenue system was well-nigh universal in its application. "Nothing was omitted from the raw product to the finished commodity; often an article received a half dozen additions ere it reached the consumer. And not only were all the constituent elements which entered into an article taxed, as the bolts, rivets, castings, trimmings and the like of an engine, but the engine when completed was subjected to an additional ad valorem duty upon its value." Customs duties were again advanced because of the increased duties upon manufactures. The act of 1864, however, went further in the direction of protection and brought rates up to a level which established a new standard of protectionism. The average rate on dutiable articles was increased to 47 per cent. The income tax of the war period was highly productive; at its maximum, incomes between $600 and $5,000 were taxed 5 per cent; and incomes above $5,000, 10 per cent. The total receipts from this source, 1863–73, amounted to $347,000,000.

When the legal tender notes were first issued they were convertible into bonds,—securities which had a definite gold value, as interest was payable in gold. The quality of convertibility was taken away by the act of 3 March 1863 and this, together with the increased issues and the waning hope that the government would be able within any short period of time to settle its obligations on a gold basis led to a marked depreciation in the value of greenbacks. In July and August 1864, the average value of the gold dollar in currency was but 39 cents. As gold was daily needed by importers to pay customs duties and to settle balances abroad, a brisk and often speculative market in bullion resulted. Moreover, the repeated fluctuations in the value of gold measured in currency, occasioned by alternating hopes and fears as to the outcome of the war, affected all business. Prices were abnormally high, and it was estimated that the cost of the war to the treasury alone was increased by the inflated issues about $600,000,000.

When peace was restored in 1865, there were three enormous tasks before the government: funding the debt into more convenient form, revision of the tariff system, and the restoration of a standard of value by the resumption of specie payment. On 1 Sept. 1865, the public debt was $2,846,000,000; less than one half of this was funded; loans bore interest at five different rates; they matured at 19 different periods; and some were convertible or redeemable at the option of the government. At first there was apparently general agreement that the volume of legal tender notes should be reduced, for on 18 Dec. 1865, the House of Representatives passed a resolution in favor of a contraction of the currency with a view to as early a resumption of specie payments as the various interests of the country would permit. The funding act of 12 April 1866, authorized the conversion of temporary short-time interest bearing securities into long-term bonds, but provided

only a slight contraction of legal tender notes. It gave authority to retire $10,000,000 within six months and not more than $4,000,000 in any one month thereafter. Even this reduction was not long continued. It was not easy for the country to readjust itself to peace conditions. Discontent was especially strong in agricultural sections where indebtedness had been incurred by farmers on long-term credits. The return of hundreds of thousands of soldiers to industry led to many ill-advised ventures and failures. Prices naturally fell with the withdrawal of the excessive demands made by war, and for this fall producers were disposed to place the blame upon the contraction in currency. On 4 Feb. 1868, after $44,000,000 in greenbacks had been retired, further contraction was suspended. In 1869 the Supreme Court in the case of Hepburn *v.* Griswold decided, four to three, that the legal tender notes were unconstitutional. In 1871 the decision was reversed on the ground that the government had the right to employ freely every means, not prohibited, which was necessary for its promotion. In 1884 the Court decided in favor of the constitutionality of issues in times of peace.

National credit was also assailed by the proposition that federal securities should be subject to local taxation and by the demand that bonds should be redeemed in currency instead of in coin. In some sections bitter attacks were made upon the rich, who were represented as owners of idle wealth which they had gained through the possession of government securities at the expense not only of the laborer who had toiled under low wages and high prices, but also of the soldier who had taken his life in his hands and had received his pay in greenbacks. In 1870 a refunding act was passed authorizing the isssue of $500,000,000 bonds at 5 per cent, redeemable after 10 years; $300,000,000 at 4½ per cent, redeemable after 15 years, and $100,000,000 at 4 per cent, redeemable after 30 years, all to be paid in coin, and exempt from national, as well as local, taxation. This act with supplementary legislation fixed the character of the debt for the next 25 years.

In 1873 a commercial panic occurred resulting in prolonged industrial depression. The treasury endeavored to relieve the situation by reissuing $26,000,000 of legal tender notes, and Congress passed a bill for a permanent increase to $400,000,000. This inflation bill was vetoed by President Grant in a notable state paper, 22 April 1874. The Republican party, then spurred on by the repeated victories of the Democrats, by Grant's firm stand and the insistence of Secretary Bristow, finally determined to make resumption effective. In the Act of 14 Jan. 1875, it was provided that resumption of specie payments should be entered upon 1 Jan. 1879, and authority was given to the secretary of the treasury to sell bonds in order to acquire the necessary amount of gold. In 1877 John Sherman (q.v.) was appointed secretary of the treasury and vigorously undertook a policy of gold accumulation; $138,000,000 in gold was regarded as sufficient to win confidence in the ability of the government to redeem all notes presented, and for this Sherman sold $95,500,000 of bonds. Resumption was accomplished on the date set.

In the meantime a new financial question had arisen. In 1873 silver was demonetized by Congress; a variety of causes led to a fall in the bullion value of silver, among which were its demonetization by Germany in 1871; the limitation of coinage in the Latin Union in 1873; and the discovery of new supplies of silver in the United States. The depression following the panic of 1873 started a new clamor for an increased supply of currency, and it was bitterly asserted that the United States had joined in a conspiracy to disown silver, and limit the volume of legal tender money, in the interest of the creditor class. A struggle ensued to secure the free and unlimited coinage of silver; and in 1878 the Bland-Allison Act was passed over the veto of President Hayes, providing for the monthly purchase of not less than $2,000,000 and not more than $4,000,000 of silver bullion at the market price. The Bland-Allison Act of 1878 continued in operation until 1890. Under its provisions 378,000,000 silver dollars were coined, at a purchase value of only $308,000,000, thus yielding a seigniorage of about $70,000,000. As the country had become accustomed to paper money, it was difficult to put the new coins in circulation; authority was consequently given for the issue of silver certificates in denominations as low as $1.00 for the deposit of coin. There was a more serious objection to continuing coinage in the fear that it would be impossible to maintain a gold standard. Secretary McCulloch in 1884 and Secretary Manning in 1885 endeavored to arouse Congress to a repeal of the act. The demand, however, for an enlarged currency, represented both by the greenback movement of the period, and by those who advocated still freer coinage of silver, made it impossible to secure this legislation.

After the Civil War sweeping changes were made in internal revenue taxes. In 1870 there were left only those on distilled spirits, fermented liquors, tobacco, banks and bankers, adhesive stamps and certain manufactured articles, and the income tax; the latter was repealed in 1872. There was less readiness to change tariff duties; protectionism had gained in strength through the growth of manufactures, and the Republican party from its origin had been committed to the principle. Slight reductions were made, but the system as a whole was maintained with little change. The country recuperated from the crisis of 1873, and beginning with 1880 large surpluses were turned into the treasury. The refunding act of 1870 hampered the government in the redeeming of bonds, except at a premium; and in 1883 Congress was forced to overhaul the tax system. All internal revenue duties were repealed except those on spirits, fermented liquors and tobacco. Rates on tobacco were reduced one half. A tariff commission recommended a substantial reduction in customs, but Congress paid little heed and enacted a protective tariff in which a harmonious framework was sacrificed to the pressure of conflicting interests. The Democrats repeatedly endeavored, particularly during President Cleveland's administration, 1885–9, to enact tariff measures, but protectionist sympathies within the party defeated every attempt. In 1889 the Republicans regained control and in 1890 enacted a measure, the McKinley bill, in which protectionism was developed to a point hitherto unknown. Increased duties were laid upon a great number of articles and in some cases the rates practically prohibited importation. The act also introduced two new princi-

ples,—a bounty on the domestic production of sugar and commercial reciprocity under executive proclamation.

In 1890 silver sentiment affecting both parties was so strong that further concessions had to be made in order to prevent unlimited coinage. An act was passed known as the Sherman silver purchase act, providing for the purchase of 4,000,000 ounces of silver bullion monthly, and the issue in payment thereof of treasury notes of full legal tender. This increased the monthly purchases of silver and authorized treasury notes of full legal tender in place of silver certificates which were of only partial legal tender quality. Treasury notes were redeemable either in gold or silver coin at the discretion of the secretary.

Under the McKinley tariff customs duties declined, and this, coupled with commercial disturbances involving the United States, resulted in the exportation of gold. Large amounts of gold were obtained from the treasury by the presentation of legal tender notes and treasury notes of 1890. The gold reserve which since 1879 had been maintained at $100,000,000, or more, began to slip away until there was fear that the treasury would be forced on to a silver basis. On 30 June 1890 the reserve stood at $190,000,000; three years later it had fallen to $95,000,000. The significance of the underlying forces which were weakening government credit were not, however, clearly seen and appropriations continued to be made with a liberal hand. In 1890 there was a surplus of $105,000,000; in 1893 it was but $2,000,000, and in 1894 there was a deficit of $70,000,000.

The Democrats won in the elections of 1892 and Cleveland again became President. In June 1893 the mints in India were closed to the coinage of silver; this led to a still further fall in the price of silver bullion and occasioned immediate apprehension that the treasury would soon be unable to redeem its obligations in gold. Within a few weeks the country was in a state of panic. President Cleveland called a special session of Congress and after most urgent pressure secured the repeal of the silver purchase act of 1890. The country did not easily recover from the panic; withdrawals of gold from the treasury continued and the administration was forced to make four issues of bonds in order to keep an adequate supply of gold on hand to meet the requirements of the "endless chain." The embarrassment of the treasury was also aggravated by an insufficient supply of revenue. The Democrats in 1894 enacted a new tariff measure which included an income tax; as introduced in the House under the leadership of Wilson, this bill was in the interest of free trade, but protective sentiment within the Democratic party radically modified the measure in the Senate, so that in its final form it made little change in existing policy. The income tax was promptly attacked on the ground of unconstitutionality. In a decision of 8 April 1895, the Supreme Court decided that a tax on income from land was a direct tax and therefore unconstitutional unless apportioned; and in a decision 20 May, income derived from other sources was also brought within the same interpretation.

The presidential campaign in 1896 was fought out on the basis of free silver. The Democrats in their platform declared in favor of the free and unlimited coinage of both gold and silver at the ratio of 16 to 1 without waiting for the aid or consent of any other nation; the Republicans, on the other hand demanded international agreement. The Republicans won and made good the victory for the gold standard in the currency act of 1900. This declared gold as the standard of value and authority was given the secretary of the treasury to maintain it by the temporary locking up of treasury notes and the sale of bonds, whenever the reserve fell below $100,000,000. The act also provided for the refunding of the debt at a lower rate of interest, and gave national banks opportunity to take out a larger amount of circulation.

Upon their return to power in 1897, the Republicans enacted the Dingley tariff; on some commodities the duties of 1890 were restored, on others compromises between the rates of 1890 and 1894 were accepted, and in a few instances the lower rates of the Wilson tariff were allowed to stand. The principle of reciprocity, dropped in the Wilson tariff, was again incorporated into the tariff system to be brought into operation, however, by treaties executed by the Senate. In 1898 war with Spain necessitated the issue of $200,000,000 of bonds and the levying of new internal revenue duties. This proved amply sufficient to meet the increased expenditures for the army and navy, and in 1901 many of the new duties were repealed.

The growth of treasury receipts and expenditures since the Civil War is shown in the following table (in millions of dollars):

	Customs	Internal revenue	Total Receipts	Expenditures
1870	195	185	396	294
1880	187	124	334	265
1890	230	143	403	298
1903	284	231	560	506

Since 1861 there have been 18 secretaries of the treasury; the most distinguished among these are as follows: Chase, notwithstanding his lack of experience with fiscal affairs, displayed political shrewdness, devotion and integrity at a time when ordinary methods of finance had to be laid aside; Fessenden, his successor, during the closing months of the war inspired confidence; McCulloch earnestly contended for an early resumption of specie payments and the retirement of the greenbacks; Boutwell in Grant's first administration carried through the refunding of the debt; Bristow in Grant's second administration, attacked corruption in the internal revenue service and placed new insistence upon resumption; Sherman left a brilliant record in making resumption successful notwithstanding the opposing forces of inflation; Manning in Cleveland's first term strongly urged a moderation of the tariff and the repeal of the Bland act; Carlisle in Cleveland's second administration upheld the credit of the government in the issue of bonds; Gage executed the provisions of the currency act of 1900; and Shaw has successfully handled the surplus and reorganized the details of the customs administration. As a whole, the treasury administration has been free from scandal. See also BANKS AND BANKING; FINANCE; MONEY, PAPER.

DAVIS RICH DEWEY,
Massachusetts Institute of Technology.

39. United States — Reconstruction in the. With the surrender of the Southern armies and the collapse of the Confederate government all organized resistance to the authority of the United States was at an end, but a problem second only to that of suppressing the insurrection now confronted the nation. This was the question of the restoration of the late insurrectionary states to their normal relations in the union and the determination of the political status of both those who had borne arms against the United States and those who had been made free by the results of the war. It was a great political and social problem, involving, on the one hand, the political reorganization or "reconstruction" of the southern State governments which had carried on the war against the Union and, on the other, "the investment of the freedmen with the rights and privileges of citizenship and the protection of them in the enjoyment of those rights and privileges." The ideas and traditions of constitutional liberty in the United States made the problem especially difficult. In Europe indefinite military occupation would have been the solution of the problem so far as it related to political reconstruction, but that was repugnant to American ideas and was, therefore, not to be thought of.

Theories of Reconstruction.—It was admitted on all hands that the collapse of the Confederacy left the Southern States in an anomalous condition so far as their political status was concerned, but opinions varied widely as to the exact nature of that status. The framers of the Federal Constitution apparently did not foresee the possibility of civil war and consequently inserted no provisions in the fundamental law relative to the status of a State which having once seceded should be reconquered and brought again under the authority of the United States. As soon as the eventual defeat of the Confederate armies was foreseen discussion of the status of the Southern States, preliminary to the work of political reorganization, became active both in and out of Congress and several well defined theories were enunciated. One of these was the view held by President Lincoln and his supporters that the act of rebellion in each State was the act of combinations of disloyal persons who had unlawfully subverted the State governments. The existence of the States themselves, he held, was not affected by the disloyal acts of their inhabitants although he admitted that as a result of rebellion the States were out of their "proper practical relations" with the Union. In his opinion, the problem of reconstruction consisted simply in placing the loyal element of each State in control of the government after which its normal relations with the Union could be resumed. By means of the executive pardon those who had engaged in rebellion could, upon promise of future loyalty, be restored to their rights and allowed to join with the loyal element in the re-establishment of the State government. This process would perhaps require the use of the military arm of the government but the intervention of Congress would not be necessary. Opposed to this lenient view was that of the more extreme radicals like Sumner and Stevens. According to their view the Southern States by act of rebellion had destroyed their corporate existence as self governing commonwealths, and should be held as conquered provinces or governed indefinitely as territorial dependencies under the plenary power of Congress. A third and somewhat intermediate view was that finally adopted by Congress, namely, that the Southern States as a result of rebellion had "deprived themselves of all civil government" and had forfeited their rights of self government. They continued to exist, but rather as disorganized communities, subject to the paramount authority of Congress to restore them to their rights as states under such conditions as it might prescribe. Other views of the status of the Southern States were but modifications of these three. It is to be noted that according to Lincoln's view the whole task of reconstruction was an executive problem, while according to the view finally reached by Congress it was a legislative problem, being derived from the Constitutional provision which makes it the duty of the United States to guarantee to each State a republican form of government — a duty which had been interpreted by the Supreme Court as devolving upon the legislative branch. This difference of view led to important consequences and greatly complicated the whole process of reconstruction.

Executive Reconstruction.— As early as 1862 large portions of Arkansas, Louisiana and Tennessee having been occupied by the military forces of the United States, President Lincoln proceeded to administer these districts through officers called "military governors," who were vested with rather vague and undefined powers. After the fall of Gettysburg and Vicksburg the President, foreseeing the ultimate defeat of the Confederate armies, gave his attention to the working out of a more definite and systematic plan of reconstruction which could be applied to all the Southern States. Accordingly in his annual message to Congress in December, 1863, he announced his plan which included an offer of amnesty to all persons who had served the Confederacy, except certain classes of men who had held high military or civil offices under the Confederate regime or who had resigned offices under the United States to engage in the Confederate service. Whenever a number of voters equal to one tenth of the voters in 1860 had taken the amnesty oath to support the Constitution of the United States, and the proclamations of the President made during the war and had re-established a State government, republican in form, such government should receive the recognition of the executive, but whether its representatives in Congress should be allowed their seats was a question to be decided by each house. "Ten per cent" governments so called were accordingly established in Louisiana and Arkansas early in 1864 and representatives in Congress were duly elected but were refused admission to their seats in December, 1864. Early in 1865 Tennessee was "reconstructed" according to the President's plan and representatives were chosen, but they likewise were refused their seats in the National House. In the meantime Congress was manifesting its disapproval of the executive method in a very substantial way. In July, 1864, it passed the Wade-Davis bill for the reconstruction of the Southern States along lines radically different from those followed by the President. Mr. Lincoln refused to sign this bill before the expiration of the session and thus defeated it. In February

1865, Congress aimed another blow at the executive method by the passage of a joint resolution which prohibited the counting of the electoral vote of any State that had passed an ordinance of secession. A breach between the President and Congress now seemed inevitable but had Mr. Lincoln lived it is highly probable that owing to his tact and influence with Congress, the difficulties would have been settled in a manner satisfactory to Congress and to the great advantage of the Southern States. After the assassination of Mr. Lincoln, the Vice-President, Andrew Johnson, a man of far more aggressive and obstinate disposition, took up his policy without material change and carried it through only to have it all rejected by Congress. On 29 May 1865, President Johnson issued a proclamation of amnesty designed for the benefit of all who had not taken advantage of Mr. Lincoln's offer of 1863. It resembled Mr. Lincoln's proclamation in all essential particulars except that it excluded a large number of persons from the privileges of amnesty, among them, all owners of $20,000 worth of property who had voluntarily enlisted in the Confederate service. Those who belonged to the excepted classes were allowed to make special application to the President, who agreed to extend such clemency as appeared to be consistent with the facts of the case and the peace and dignity of the United States. By subsequent proclamations President Johnson appointed "provisional governors" for North Carolina, Georgia, Mississippi, Alabama, South Carolina and Florida, the reconstruction of the other Southern States being regarded as already complete. These officials were directed to call conventions in their respective States for the purpose of amending their old constitutions so as to adapt them to the new conditions created by the results of the war, after which they were to be restored to their normal relations with the Union. Before the end of the year conventions had been held in all these States except Texas, and they had adopted constitutional amendments either "repealing" the ordinances of secession or pronouncing them null and void. Likewise they had all abolished slavery, most of them had repudiated all debts incurred in aid of the rebellion and all but Mississippi and Florida had ratified the thirteenth amendment to the Federal Constitution. Moreover they had held elections, chosen State officers and representatives in Congress and the legislatures had elected United States senators. When, therefore, Congress met in December, 1865, for the first time since the close of the war, the President took great satisfaction in informing that body that all the late insurrectionary States except Texas, whose convention was not to meet until March of the following year, had been reconstructed and were ready to resume their constitutional places in the Union. Congress, however, ignored the whole scheme of reconstruction which Lincoln and Johnson had carried out, refused to admit the senators and representatives from the Southern States to seats in Congress and appointed a joint committee of 15 members to inquire into the condition of these States and report whether any of them were entitled to representation in Congress. One of the chief reasons which led Congress to veto the executive policy was the drastic character of the police legislation which some of these States had enacted in the summer and autumn of 1865 for the purpose, it was alleged, of keeping the negroes in a condition of involuntary servitude if not of actual slavery. The offense of vagrancy was so defined that few freedmen could escape punishment. Those who were unable to pay the fines imposed upon them were to be "sold out," their former masters being given the preference as lessees. A harsh and unnecessary apprentice system for binding out colored minors was adopted. In Mississippi negroes were prohibited from renting or leasing land in incorporated towns and in most of the Southern States they were denied the right to give testimony in the courts except in cases in which negroes were parties. The demoralization of the negro race in 1865 was undoubtedly such as required stringent police measures to prevent crime and pauperism; but in singling out the black race for especial punishment the Southern legislatures greatly offended the sentiment of the North. In April, 1866, Texas having complied with the requirements of the executive scheme of reconstruction the President issued a proclamation officially declaring the rebellion at an end. In June the Reconstruction Committee made its report declaring that the Southern State governments established under the executive auspices were illegal (although they had been regarded as good enough to ratify the Thirteenth Amendment), that Congress alone had authority to reconstruct these governments, and that guarantees of future security should be required as a condition of restoration to the Union. The committee recommended the denial of representation to these States until sufficient guarantees for the protection of the civil rights of the negro were forthcoming and that a portion of those guilty of having taken part in the rebellion be disfranchised from voting and disqualified from holding office.

Congressional Reconstruction.— When Congress met in December 1866 an effort was made to impeach the President (see UNITED STATES — IMPEACHMENTS IN), the Tenure of Office Act was passed to limit his power of removal. His power, also, as commander-in-chief of the army and his power of clemency were abridged and a law was passed requiring the new Congress to meet on 4 March following. In February Congress passed in spite of the President's veto the first of the Reconstruction Acts for the more efficient government of the late insurrectionary States. This act grouped the said States into five military districts each of which was to be placed under the command of an army officer who was charged with the maintenance of order and the protection of property. The State governments were left intact but were declared to be provisional only and subject to the paramount authority of the United States. By a supplementary act of 19 March, likewise passed over the President's veto, the military commanders were directed to cause to be made a registration of the qualified voters without regard to race or color and to call a convention, if the majority of the voters were in favor of one, for the purpose of adopting a new constitution. When the constitution should be approved by Congress the State should be readmitted to representation in both Houses of the National legislature. Military commanders were promptly appointed for the different districts and with adequate forces they took posses-

sion and proceeded to govern the inhabitants according to the forms of military law. Arbitrary arrests were common, trial by jury was superseded by trial by military commission and various orders having the force of law were issued for the regulation of the conduct of the citizens. The new colored voters were registered, many of the old white voters were excluded for participation in the rebellion, conventions were chosen in all the Southern States by the new electorates and by May 1868 these conventions had all adopted constitutions establishing negro suffrage and disqualifying large numbers of white persons. In all the States except Mississippi, Texas and Virginia these constitutions were promptly ratified by the new electorates and in June they were readmitted to representation in Congress. In Mississippi, where a constitution containing several provisions of a proscriptive character had been framed the whites after a determined campaign succeeded in defeating it at the polls. In Texas and Virginia, where likewise obnoxious provisions had been inserted in the constitutions the reconstructionists were induced to delay indefinitely submission to the people. These three States, therefore, continued under military rule. In the meantime the legislature of Georgia having excluded the negro members-elect from their seats, the United States Senate refused to admit the senators from that State to seats in Congress. Consequently at the time of the accession of President Grant four of the Southern States were still unrestored to their constitutional positions in the Union. He was induced to recommend to Congress the resubmission of the constitutions of Mississippi and Virginia to the voters in such a way as to enable them to vote separately upon the obnoxious provisions. Congress so directed; the constitutions were resubmitted, and were ratified without the objectionable provisions. By the same act Congress directed the submission of the Texas constitution to the people and it was duly ratified. These three States were punished for their tardiness by the imposition of an additional condition precedent to restoration, namely, the ratification of the 15th Amendment. Early in 1870, having complied with this additional requirement they were readmitted to representation in Congress and restored to their full positions in the Union. Finally after having been twice reconstructed Georgia complied with the new conditions imposed by Congress and in June was likewise restored to her place under the constitution. The military governments now gave way to the State governments, Federal interference was withdrawn, and reconstruction technically at least was completed.

Civil and Political Rights for Freedmen.— Slavery having been abolished by the 13th Amendment, adopted in 1865, the investment of the negro with civil rights followed as a necessary incident of his new status. Some of the Southern legislatures in 1865 passed laws denying the freedmen the right to own real estate in some cases and to give testimony in the courts and having otherwise abridged their civil rights, Congress in April 1866 passed over the President's veto the noted Civil Rights Act which conferred upon all persons of color the status of citizenship and placed them upon an equality with white citizens in the making and enforcing of contracts, in suing and giving testimony in the courts, in acquiring, holding, and conveying real as well as personal property, and in the enjoyment of equal protection of the laws for the security of person and property. The United States courts were given jurisdiction of cases arising under the act, and the President was empowered to use the army and navy to enforce it. Foreseeing the possible return to power of those opposed to civil rights for the negro and the consequent repeal of the act, Congress immediately proposed the 14th Amendment, embodying the principles of the Civil Rights Act. To incorporate it in the Constitution would have the effect of placing the civil rights of the negro beyond the reach of any hostile Congress. Ratification of this amendment by the Southern States was made a condition precedent to their restoration to the Union. Finally, in July 1868, Congress declared that the amendment had been ratified by the requisite number of States and was therefore proclaimed a part of the Constitution. The amendment declared that all persons born or naturalized in the United States and subject to the jurisdiction thereof are citizens of the United States and of the State in which they reside; provided for a reduction of the representation in Congress of any State that should deny the suffrage to any of its adult male citizens; disqualified many of the prominent ex-Confederates from holding Federal office; invalidated all debts and other obligations incurred in aid of the rebellion; and prohibited the States from abridging the privileges of citizens or denying to any person the equal protection of the laws. By the threat of reducing their representation in Congress the nation offered an inducement to the Southern States to give the negro the right of suffrage, but it was soon discovered to be insufficient, and in February 1869 a new amendment (the 15th) was proposed which declared that the right to vote should not be denied or abridged by the United States or by any State on account of race, color, or previous condition of servitude. Ratification of this amendment was imposed as a condition precedent to the re-admission of the four States of Mississippi, Texas, Virginia, and Georgia, which still remained under military government and without representation in Congress. By March 1870 the requisite number of States had ratified the amendment and it was proclaimed a part of the fundamental law. Although this important amendment did not directly confer the suffrage upon the negro it did confer upon him an exemption from discrimination upon the part of any State in fixing the qualifications for voting. Having secured full civil and political rights for colored citizens, the Republican leaders now undertook, by an act of March 1875, to secure social equality for all colored persons in hotels, public conveyances, theatres, and other places of public amusement, but the Supreme Court held the act void as beyond the power of Congress.

The Freedmen's Bureau.— One of the agencies through which the process of reconstruction was worked out was the Freedmen's Bureau, first established in March 1865 and placed under the supervision of the War Department. In general, its purpose was to aid and advise the large number of freedmen who were demoralized and made helpless as a result of sudden liberation. During the last years of the War thou-

sands of blacks left the plantations and gathered about the camps or followed in the wake of the Federal armies. To provide for their support was a difficult problem which every commander in the South had to meet. At first, appeals were made to philanthropic persons of the North for funds with which to support this class, and generous responses followed, but as the end of the War approached the number of negro "contrabands" increased until it was found impossible to rely wholly upon the support of charitable relief. Being released from the restraints of slavery, many freedmen made good use of their liberty to quit work and wander about the country only to find themselves, after a brief season, in a state of destitution. Others who continued to labor on the farms of their former masters were sometimes taken advantage of in regard to labor contracts, and were denied the rights of free men which the results of the War had brought them. The Bureau undertook to provide hospitals and medical relief for the sick and infirm; it distributed large quantities of food to the destitute; it undertook to prevent the infringement of the civil rights of freedmen; it provided special courts for the trial of accused freedmen in all cases in which the State excluded the testimony of colored witnesses; it examined and approved their labor contracts; it circulated the emancipation proclamation among the blacks of the remote districts; it instructed them as to their new duties and responsibilities; it urged them to labor and impressed upon them the sacredness of the marriage contract; it established schools and supplied teachers to such communities as wished them; and in various other ways undertook to aid the unfortunate blacks whom emancipation had left to shift for themselves. The officials of the bureau also used their influence with the credulous blacks to induce them to enter into labor contracts with planters and thus performed a service not without value to the white race.

The organization of the bureau was quite elaborate. Its head was a commissioner, this office being held by General O. O. Howard (q.v.); there was an assistant commissioner for each State, and a number of sub-commissioners, each in charge of a particular district of the State. In every locality was stationed an agent who acquainted the freedmen with the orders of the bureau, distributed the rations, and performed various other duties. The law as passed in 1865 made no appropriation for the support of the bureau, but its income from the sale of certain confiscated property and the rent of abandoned lands was sufficient to meet expenses. In July 1866 a new act was passed and the operations of the bureau largely extended. It was not finally withdrawn from all the Southern States until 1872. Although the bureau accomplished some good it did not promote the harmonious relations between the two races which it was expected to do. The agents of the bureau were mostly subordinate military officers and a considerable number of them turned out to be inefficient and unscrupulous. Too often able-bodied freedmen were encouraged in their idle habits by the distribution of government rations, while in not a few cases they were led to believe that the lands were to be distributed among them. Likewise it frequently happened that the zeal of the bureau officials for the enforcement of exaggerated rights led to violent conflicts between white citizens and the military forces which were at the disposal of the bureau.

The "Carpet-Bag" Regime.—The reconstruction acts by enfranchising the negroes and disqualifying large numbers of the more influential whites made it possible for the blacks to get possession of the governments in most of the Southern States and to rule them in a most ignorant and extravagant manner. They were made use of by unprincipled adventurers from the North who flocked to the South in considerable numbers after the close of the War, some to engage in the profitable industry of cotton planting, others to fill the offices from which the more prominent Southern whites were excluded. These Northern immigrants came to be called "carpet-baggers" by the native whites, in allusion to the popular assertion that all their worldly effects were carried in a carpet-bag. By no means all of the Northern men who came to the South at this time were unscrupulous adventurers bent upon plunder, but they all allied themselves on the side of the negro in political matters, thus increasing the bitterness of race antagonism. A few native Southerners—"scalawags," they were called—also allied themselves politically with the northern men and negroes for the purpose of sharing in the offices. Both these classes of whites were bitterly hated by the native Southern element who saw themselves excluded from power by strangers and others who had little substantial interest in the State. The influence of the carpet-bag class over the negroes was at first very great. They organized the freedmen into political clubs, instructed them in the art of voting, and made use of them to further their own political ambitions. The carpet-baggers secured the nominations to the more important offices and were easily elected by large black majorities. But the colored voters were not content to see all the offices held by their white allies, and their ambition was frequently too great to be ignored. Consequently many of the important offices came to be held by ignorant blacks who but a few years previous were field-hands on the plantations. In several States negroes filled the offices of lieutenant-governor, secretary of state, superintendent of education, and other important offices. In some instances they even sat upon the benches of the higher courts, while they filled many minor judicial positions. They occupied seats in the legislatures of all the Southern States, that of Mississippi in 1871 having as many as 55 colored members. A considerable portion of these were ignorant, some of whom were unable to read or write, and all of whom were the pliant dupes of unscrupulous northern men. With the State and local governments controlled by ignorant negroes and designing white men, an era of extravagance, misrule, and corruption set in which in some instances amounted to outright robbery and plunder. Long and frequent sessions of the legislature were held for service in which the members voted themselves large per diem allowances. Old laws were ruthlessly repealed and replaced by bulky statutes, many of which bore the car marks of animosity and oppression. Counties were rechristened with names full of offense to Southern whites. Laws favoring social equality were passed. Public school systems on an extravagant scale for the

children of both races were established and taught by Northern teachers. Offices were greatly multiplied — many of them mere sinecures — for the benefit of good Republicans. Gigantic schemes of public improvement were undertaken, most of which were marked by frauds and extravagance. The rate of taxation was increased out of all proportion to the ability of the people to pay in their then impoverished condition resulting from four years of destructive war. In Mississippi this rate was increased from one mill on the dollar in 1868 to 14 mills in 1871, and the inability of the people to pay resulted in the confiscation of one fifth of the land of the State. Large debts were incurred for projected improvements, especially in Louisiana and South Carolina, where a wholesale system of plunder was carried out by the reconstruction governments. In the latter State the public debt was increased from $5,000,000 in 1868 to nearly $20,000,000 in 1874. The tax levy was increased four-fold, although the value of taxable property had declined 100 per cent. Large gratuities were voted State officials, the State capitol was furnished after the manner of a European palace, and vast sums were squandered in reckless schemes for public improvement.

Under these conditions the tax payers grew restless and disorders began to occur here and there. They naturally chafed under the rule of their former slaves who were controlled by strangers possessing no permanent interest in the South. Wherever the negroes were in the majority they carried the elections and controlled the government. The extravagance and corruption of their rule aroused the whites to adopt concerted measures for counteracting the political power of the negroes by terrifying them and keeping them away from the polls at election times. This was effectively accomplished by the organization of secret bands, the best-known of which was the so-called Ku-Klux Klan, said to have originated in Giles County, Tenn., in 1866. At first it was intended to serve as a disciplinary organization for scaring the superstitious blacks into good behavior, but with the ascendency of the negro to political power with its resulting imbecility and corruption the purposes of the Ku-Klux Klan were changed to meet the new situation. Its jurisdiction was styled the "Invisible Empire"; the chief functionary was the Grand Wizard; each State was a realm ruled over by a Grand Dragon. Then there were Dominions, Provinces, and Dens presided over by Grand Titans, Grand Cyclopses, Ghouls, etc. The organization was elaborate and mysterious; there was a constitution and a solemn ritual, and a gruesome mode of initiation, all of which appealed to the curious and at the same time excited the fear of the superstitious blacks. The members of the Klan when in service wore hideous disguises, the sight of which terrified the negroes and sent them running to their cabins. Prominent negro politicians, obnoxious carpet-baggers, and scalawags, Northern teachers of negro schools, were the most common victims of the Ku-Klux activities. Usually the Klan made known its orders by a warning couched in mysterious language, but always intelligible enough to convey its meaning. After the withdrawal from the South of the military governments between 1868 and 1870 Ku-Klux outrages threatened the peace and security of the South. Republican legislatures passed anti-Ku-Klux acts, and Republican governors offered large rewards for persons guilty of going in disguise to commit crime, but public sentiment was too much in favor of Ku-Klux methods to make either effective. Besides, it was next to impossible to convict anyone if caught and put on trial. Upon the recommendation of President Grant Congress appointed a joint committee to make a thorough investigation of conditions in the South, and the voluminous testimony which it took showed conclusively that hundreds of murders had been committed in the Southern States by Ku-Klux bands, besides many outrages of a less flagrant character. To meet the situation Congress passed, in 1870, the so-called Enforcement Act giving the federal courts jurisdiction over certain offenses committed with the intent of depriving colored persons of their rights as citizens of the United States. In April of the following year Congress passed another Enforcement Act which further extended the jurisdiction of the United States courts and authorized the President to employ the army and navy and to suspend the writ of habeas corpus if necessary to put an end to Ku-Klux outrages. It also empowered Federal judges to exclude from juries persons believed to be in sympathy with the Klan. In pursuance of this act the Federal attorneys in the Southern States made special exertions to secure the indictment of those engaged in the Ku-Klux outrages, and hundreds of indictments were found, but few convictions followed, owing to the sympathy of the juries for the accused. Acts were also passed for the supervision of Federal elections in the hope of securing to colored voters the unobstructed enjoyment of the right of suffrage which the 15th amendment had conferred upon them. But all the efforts of Congress to secure the political rights of the freedmen failed because it involved negro domination, and this had proved intolerable to the whites. See Ku-Klux Klan.

The Undoing of Reconstruction.— For a time the reconstructionists in the South were able, with the aid of Federal troops to maintain their power, but as the extravagance and corruption of their rule increased the discontent of the native whites, who were the chief sufferers, became more general. Organized intimidation and ballot box frauds were openly committed for the purpose of defeating the Republicans in the elections. Race collisions and election riots were of frequent occurrence, and in all of them the blacks were the chief sufferers. In several States rival governments were set up and civil war threatened. Negro militia companies were organized, but they were ineffective and served only to inflame the passions of the whites and increase their determination to overthrow the Republican governments by violence. The government at Washington showed less readiness to call out troops to interfere at the elections and a growing disposition to leave the Southern State governments to take care of themselves. Under these as early as 1870 the Democrats had regained control of North Carolina, Tennessee, Texas, Georgia, and Virginia. Meantime the progress of the Southern movement was aided by the wholesale removal by Congress of the political disabilities of the Southern whites and the division of the Southern Republicans into

radical and conservative wings, the latter of which joined with the Democratic organizations. In 1874 Alabama and Arkansas were carried by the Democrats and the carpet-bag governments in those States came to an end. In the following year, after a remarkable campaign, characterized by violence, riots, and wholesale intimidation, Mississippi was carried by the Democrats, who speedily got rid of three of the State officers, including the governor, by means of impeachment. In the following year the "Mississippi plan" was employed with success in the three remaining Southern States which were still "unreclaimed," namely, Louisiana, Texas, and Florida. Solid Democratic delegations were now sent to Washington, most of the carpet-baggers returned to the North, and the Southern whites were left in control. The subsequent disfranchisement of the negro race in Mississippi, Louisiana, South Carolina, Alabama, North Carolina, and Virginia, and the judicial approval by the Supreme Court of these disfranchising constitutions insured the permanent rule of the white race, and thus marked the final and complete undoing of reconstruction so far as its political effects were concerned.

Bibliography.—Andrews, 'The United States During the Last Quarter of a Century'; Burgess, 'Reconstruction and the Constitution'; Blaine, 'Twenty Years of Congress'; Dunning, 'Essays on the Civil War and Reconstruction'; Herbert, 'Why the Solid South?'; McCarthy, 'Lincoln's Plan of Reconstruction'; McPherson, 'Political History of Reconstruction'; Scott, 'Reconstruction in Civil War.'

James Wilford Garner,
Professor of Political Science, University of Illinois.

40. United States — Last Three Amendments to the Constitution of the. The last three amendments to the Constitution are popularly known as the War Amendments. This designation is not without justification in their origin. The difficulties involved in amending the Constitution are so great that but for the conflict with which in the popular mind these amendments are associated, it is doubtful if the principles which they embody could ever have been incorporated into it. These amending articles primarily concerned the negro race, and their adoption marked the transition of these people from slavery to citizenship. They meant that within a period of five years more had been accomplished than had been by half a century of polemical discussion. They embodied the results of such a revolution of public sentiment as only war could have effected. The emancipation of the American negro was never a more remote probability than at the outbreak of the Civil War. Almost the entire time of the last session of the 36th Congress, 3 Dec. 1860 to 2 March 1861, was devoted to the consideration of various measures calculated to compromise sectional differences. Every plan proposed had as its basis an effort more specifically to guarantee against outside interference the institution of slavery in the States wherein it then existed. On 11 Feb. 1861, without a dissenting vote the House agreed to a resolution of Mr. Sherman of Ohio which indicated the spirit of that body. It declared that neither Congress nor the people of the non-slave-holding States had any right to interfere with the institution in any State in which it was established. A few days later the House went much further than this, and by a vote of 133 to 65 passed the Corwin resolution, proposing an amendment to the Constitution. This provided that the Constitution should never be so amended as to empower Congress in any way to interfere with slavery in the States. It is significant of the sentiment which then pervaded the country that this resolution secured the support of such men as Charles Francis Adams, Schuyler Colfax, Henry Winter Davis, Justin S. Morrill, and John Sherman. On the last day of the session, 2 March, it received the constitutional majority in the Senate, and was duly proposed to the country as the Thirteenth Amendment. Few more striking contrasts are presented in the history of the development of the Constitution than that between the amendment with which Congress would thus have commemorated the opening of the great conflict, and the one which marked its close. This resolution was ratified by Ohio, Maryland and Illinois, but its fate possesses scant interest now, if indeed it did even at that time. Men soon realized that the hour of compromise had passed,— that the great issues which had so long disturbed the repose of the country had been removed from the halls of Congress and submitted to the arbitrament of the sword.

Mr. Lincoln's attitude at this time was thoroughly in accord with that of Congress. In his inaugural address he declared that he had no purpose, inclination or right to interfere with slavery in the States. To emphasize his position he quoted from the platform on which he had been elected, and also declared that as in his opinion the proposed Corwin amendment was already "implied constitutional law" he had "no objection to its being made express and irrevocable." There can be no question that in these declarations Mr. Lincoln gave expression to his most earnest convictions. The fact that within two years after he uttered them he felt compelled, "upon military necessity," to issue the Emancipation Proclamation affords some idea of the significance and magnitude of the events which made for the first of the war amendments. When, on 1 Jan. 1863, Mr. Lincoln followed his provisional proclamation of the preceding September by one unconditional in its terms, no one knew better than he that it was literally no more than it purported to be on its face,— a war measure, pure and simple. The Emancipation Proclamation designated certain States and parts of States within the field of military operations as "in rebellion," and declared free all slaves within such districts. It advised the slaves so emancipated to labor for wages and to refrain from acts of violence, and announced that they would be received into the armed service of the government. Such a proclamation was mere *brutum fulmen* without military force behind it. It meant no more to the slaves in territory not actually occupied by the Union army, so far as their status at that time was concerned, than a piece of blank paper. Its immediate effectiveness anywhere was dependent upon the force of arms, the perpetuity of its declarations upon the ultimate outcome of war. The very limitations which its own terms placed upon its geographic application carried with them the necessity of a constitutional ratification in order to render the principle enunciated both

general and permanent. From the date of that document another amendment to the Constitution became an event contingent only upon the triumph of Union arms.

The Thirteenth Amendment.— It is one of the singular turns of the history of anti-slavery agitation that although New England had been so long identified with the abolition movement, it should fall to the lot of a man from a western slave State to formulate and introduce the amendment which was to write into the Constitution the fulfillment of the highest hopes of Garrison and Phillips. It was Mr. Henderson of Missouri, who on 11 Jan. 1864 introduced in the Senate the joint resolution which became the 13th Amendment. This resolution, somewhat amended by the Judiciary Committee, passed the Senate on 8 April by a vote of 38 to 6. Abolition sentiment had not gained ground rapidly in Congress. That body had put itself on record many times as carrying on the war for the sole purpose of preserving the Union. As late as 22 and 25 July 1861, after the battle of Bull Run, the Crittenden resolutions declared that the war was not waged "for the purpose of overthrowing or interfering with the rights or established institutions" of the Southern States. These resolutions had been agreed to in the House with but two negative votes, and in the Senate but five were recorded against them. There were also many members who realized that slavery was doomed, but were unwilling formally to put themselves on record as cooperating in its destruction. It was not surprising then that the Henderson resolution was rejected when it came up in the House on 15 June. But 95 votes were cast in its favor. The election of 1864 determined beyond all question that the country indorsed Mr. Lincoln's administration. This meant more than mere approval of his course in conducting the war. The Emancipation Proclamation, and an amendment to give it effect upon the restoration of peace, were just as truly issues of that election as was any other feature of the administration. From the first the President had been a champion of the Henderson resolution, and he was quick to take advantage of the result of the election in urging upon the House the necessity of its passage. This he did in his annual message of 6 Dec. 1864. He called the attention of the House to the result of the recent contest, and told them that it meant the passage of the measure by the next Congress, if it failed in this. He declared the election to be "the voice of the people now, for the first time heard upon the question" at issue. We need not consider which most influenced their action, Mr. Lincoln's message or the determination to accept an accomplished fact. On 31 Jan. 1865, by a vote of 121 to 24, the House finally passed the resolution as it came from the Senate: Section 1. Neither slavery nor involuntary servitude, except as a punishment for crime whereof the party shall have been duly convicted, shall exist within the United States, or any place subject to their jurisdiction. Section 2. Congress shall have power to enforce this article by appropriate legislation. On 18 Dec. 1865, the 13th Amendment was declared a part of the Constitution.

The Fourteenth Amendment.— On the first day of the memorable 30th Congress, 4 Dec. 1865, Mr. Stevens submitted a resolution providing for a joint committee of 15 to inquire into the affairs of "the so-called Confederate States." The resolution created what became known as the Reconstruction Committee. To this committee was referred every bill, resolution or petition bearing upon any phase of the relations between the Southern States and the general government, or involving consideration of the future status of the negro. The only result of their labors in which we are interested was submitted to both Houses on 30 April 1866, as their plan for the reconstruction of the Southern States. This consisted of three features, embraced in a joint resolution, proposing a constitutional amendment, and two bills. The three combined did not differ greatly from the 14th Amendment as finally adopted. The first section of the joint resolution did not contain a definition of national citizenship. In other respects it was the same as that adopted. Its second section, reducing representation for suffrage abridgment, was adopted substantially as reported. Section 3 deprived of the right to vote for electors or representatives until 4 July 1870, all those in any way identified with the "late insurrection." One of the bills reported as part of this plan provided for rendering ineligible to office certain proscribed classes of men in the Southern States. This bill formed the basis of the third section of the amendment as adopted, in lieu of the one reported by the committee. The fourth section was similar to the fourth section of the amendment, except that it did not contain the provision as to the validity of the public debt. The first of the bills reported provided that when the amendment proposed therein should have become part of the Constitution, and been ratified by "any State lately in insurrection," the senators and representatives from such State "might" ["may"] be admitted into Congress as such." This bill did not pass either House, nor did Congress commit itself in any way to the policy suggested by it,— that of admitting the Southern States upon their ratification of the proposed amendment. The House passed this joint resolution just as it came from the committee, the Senate making the amendments outlined above. These modifications brought the resolution to the shape in which it now stands as the 14th Amendment. The Senate passed it 8 June 1866 by a vote of 33 to 11. On 13 June the House agreed to the Senate amendments by a vote of 138 to 36. A study in detail of the ratification of this amendment would take us further afield than we can go, for here the history of the amendments and that of Reconstruction so blend as to become difficult of separate treatment. Thus would be opened up the whole question of the rejection of the amendment by the Southern States, save Tennessee, and of the effect of such rejection upon the subsequent action of Congress toward those States in the matter of negro suffrage and the last amendment. In the process of Reconstruction ratification became, in specific terms, a condition precedent to the readmission of the Southern States, and was declared accomplished in Seward's proclamations of 20 and 28 July 1868.

THE FOURTEENTH AMENDMENT.

Section 1. All persons born or naturalized in the United States, and subject to the jurisdiction thereof, are citizens of the United States and of the State wherein they reside. No State shall make or enforce any law which shall abridge the privileges or immunities of

citizens of the United States; nor shall any State deprive any person of life, liberty, or property without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws.

Section 2. Representatives shall be apportioned among the several States according to their respective numbers, counting the whole number of persons in each State, excluding Indians not taxed. But when the right to vote at any election for the choice of electors for President and Vice President of the United States, representatives in Congress, the executive and judicial officers of a State, or the members of the Legislature thereof, is denied to any of the male inhabitants of such State, being 21 years of age, and citizens of the United States, or in any way abridged, except for participation in rebellion, or other crime, the basis of representation therein shall be reduced in the proportion which the number of such male citizens shall bear to the whole number of male citizens 21 years of age in such State.

Section 3. No person shall be a senator or representative in Congress, or elector of President and Vice President, or hold any office, civil or military, under the United States, or under any State, who, having previously taken an oath, as a member of Congress, or as an officer of the United States, or as a member of any State legislature, or as an executive or judicial officer of any State, to support the Constitution of the United States, shall have engaged in insurrection or rebellion against the same, or given aid or comfort to the enemies thereof. But Congress may, by a two-thirds vote of each House, remove such disability.

Section 4. The validity of the public debt of the United States, authorized by law, including debts incurred for pensions and bounties for services in suppressing insurrection or rebellion, shall not be questioned. But neither the United States nor any State shall assume or pay any debt or obligation incurred in aid of insurrection or rebellion against the United States, or any claim for the loss or emancipation of any slave; but all such debts, obligations, and claims shall be held illegal and void.

Section 5. The Congress shall have power to enforce, by appropriate legislation, the provisions of this article.

The Fifteenth Amendment.— Propositions having negro suffrage as an end were almost as numerous during this period as were similar efforts toward an emancipation measure prior to 1865. Indeed, one of the most frequently suggested means of enforcing the 13th Amendment was by conferring suffrage upon the freedmen. Limitations of space render it impossible to trace here the evolution of the 15th Amendment through these numerous bills and resolutions. It has been noticed above that the author of the 13th Amendment was a Senator from a Western slave State,— Mr. Henderson of Missouri. It is even more singular that the same man should also have introduced the resolution which became the 15th. Early in the first session of the 40th Congress, 7 March 1867, Mr. Henderson introduced a resolution proposing an amendment to the Constitution which would prohibit a State from abridging the right "to vote or hold office on account of race, color, or previous condition." The 40th Congress had three sessions, and the Henderson resolution slept in the Judiciary Committee until well along toward the close of the third. It was reported by Senator Stewart, on 15 Jan. 1869, amended to read as follows:

"The right of citizens of the United States to vote and hold office shall not be denied or abridged by the United States, or any State, on account of race, color, or previous condition of servitude."

The Senate passed this resolution on 17 February. The House amended it by striking out the words "by the United States," which would have left Congress with absolute control over negro suffrage. It also added to the grounds upon which suffrage abridgment was denied the States those of nativity, property, and creed. The House had just refused to accept from the Senate such an amendment to a resolution of its own. Its action now, in tacking this on to the Senate measure, showed an utter absence of anything like agreement between the two bodies as to the precise form of the amendment. The situation finally yielded to considerations of party expediency, and the House acceded to the Senate's request for a conference. This resulted in a recommendation that the House recede from its amendments and agree to the Senate resolution. The latter, however, was to be amended by striking out the words "and hold office." Here was another important compromise to be engrafted on the Constitution, whereby was secured the 15th Amendment as we have it to-day:

Section 1. The right of citizens of the United States to vote shall not be denied or abridged by the United States, or by any State, on account of race, color, or previous condition of servitude.

Section 2. The Congress shall have power to enforce this article by appropriate legislation.

Under the operation of the previous question the House was able to secure an agreement to this report as soon as submitted, 25 February. In the Senate, however, serious opposition developed among the friends of the measure. It was claimed that too great a sacrifice to expediency had been made in striking out the words "and hold office," and thus reducing the scope of the amendment to the matter of suffrage alone. On this account Mr. Edmunds, one of the managers at the conference, had refused to sign the report, and now opposed the amended measure on the floor of the Senate. The session was drawing to a close, and perhaps there was something in the taunt of the minority that the dominant party dare not trust the fate of the measure to the succeeding Congress. Though markedly earnest, the debate was not protracted. The Senate passed the resolution on 26 February. On 3 March Congress adjourned. In the unusual form of a special message from the President, communicating its promulgation by the Secretary of State, the last of the War Amendments was declared adopted on 30 March 1870.

Validity and Enforcement.— The charge of "irregularity," of a departure from established constitutional methods, was made by the minority against all the legislation enacted by Congress during the eventful years covering the period of Congressional Reconstruction. It was urged with greater force against the validity of the action by which the passage and adoption of these amendments were secured. Against the 13th was brought the charge that West Virginia, whose ratification was declared necessary, had been created a State in disregard of the letter and spirit of the Constitution. The question of the right of a State to rescind a ratification once given was raised in the case of the 14th and 15th, as also the constitutionality of the entire plan of Congressional Reconstruction. It was not long, however, before the minority realized the necessity and wisdom of accepting the amendments as a matter of public policy. By February 1872 both parties in the House had gone on record as formally recognizing their validity, and the question ceased to possess more

than a mere academic interest. The energy and earnestness of the Reconstruction statesmen were not exhausted with the adoption of the amendments. Immediately following the ratification of each one they set to work to enforce its provisions with the same determination which had characterized their efforts to secure its incorporation into the organic law. Various acts, some directed against peonage in New Mexico, others against the kidnapping of negro children, were passed to render impossible the placing or retaining of anyone in a state of involuntary servitude. The principal act for enforcing the 13th Amendment clearly anticipated important provisions of the succeeding amendment. This was the Civil Rights Bill of 9 April 1866. The emancipating amendment left the late slaves in an anomalous position, and to meet the difficulties of their situation was the prime object of this elaborate measure. It declared all persons born in the United States, not subject to a foreign power, except Indians not taxed, citizens of the United States. Here we have a near approach to the definition of national citizenship contained in the first section of the 14th Amendment. It gave to every citizen so defined the same rights of property, and the same protection of person and property, enjoyed by the white citizen. It provided extraordinary means, judicial and executive, for its own enforcement, and for guaranteeing protection to all persons in their "constitutional rights of equality before the law." This act was passed over Johnson's veto more than two years before the adoption of the 14th Amendment, yet it served the purpose of an enforcing act for that amendment long after its ratification. Indeed, it answered that purpose, without even being amended, until after the ratification of the 15th Amendment. These enforcing acts themselves illustrate the process of development through which the negro passed in his transition from slavery to citizenship. They reflect the views of their framers as to the significance of each step taken in that movement. Thus it appears that an act merely to enforce the emancipating amendment was considered broad enough to cover the first section of the Fourteenth also. Extreme views were entertained as to the power of Congress in regard to the matters covered by the amendments. The last two were not proposed by Congress because that body doubted its constitutional right to accomplish the same ends by legislation, but simply to remove those matters beyond the reach of a possible hostile majority. The next enforcing act was that of 31 May 1870. This was "to enforce the right of citizens of the United States to vote," but it also re-enacted, with some additional provisions, the Civil Rights Bill of 1866. Means were provided for preventing suffrage discriminations on account of color under almost any contingency that could rise. The act also provided for enforcing the third section of the 14th Amendment, prohibiting certain classes in the Southern States from holding office. This act was amended 28 Feb. 1871, by one which provided still more elaborate machinery for enforcing the right to vote. Among other features it required judges of United States circuit courts to appoint supervisors of Congressional elections, upon petition of two citizens. This, however, applied only to cities of at least 20,000 inhabitants. The act of 20 April 1871, was the first specifically directed to the enforcement of the 14th Amendment. This was known as the Ku-klux Act, and of all the enforcing laws it was the most drastic. The others conferred upon the federal courts jurisdiction for acts in violation of their provisions, and for their enforcement placed at the call of even petty officials the military and naval branches of the government. This authorized the President in certain contingencies to suspend the privileges of the writ of habeas corpus. It was directed primarily against alleged conspiracies in the Southern States to render inoperative the first section of the 14th Amendment. The second and last act to enforce the first section was the Civil Rights Act of 1 March 1875. The first two sections of the act attempted to do for the newly declared citizens, in the sphere of what may be called social privileges, what the Civil Rights Bill of 1866 had done in the field of property rights. They declared all persons within the jurisdiction of the United States "entitled to the full and equal enjoyment of the accommodations, advantages, facilities, and privileges of inns, public conveyances on land or water, theatres, and other places of public amusement." Infractions of this act gave rise to the Civil Rights Cases, which furnished the occasion for one of the most important interpretations of the 14th Amendment ever announced by the Supreme Court. The one section of the 14th Amendment which has never been enforced is the second,— which provides for reducing the representation of States as a penalty for abridgments of the suffrage. Some of the men most prominent in Reconstruction legislation have announced the opinion that this section was rendered nugatory by the adoption of the 15th Amendment. This question, however, has not been passed upon, in the absence of enforcing legislation. Such legislation was attempted in the first apportionment act after the new amendment, that under the census of 1870. It was at once discovered that the question was one involving numerous practical difficulties,— difficulties probably unforeseen by the framers of the section, certainly entirely unprovided for by them. The advocates of changing the basis of representation in accordance with the new provision had finally to content themselves with merely restating in the apportionment act the penalty provided in the amendment itself.

Interpretation.— The 14th Amendment has overshadowed the other two, alike in the number and the importance of the cases involving its interpretation by the Supreme Court. A consideration of the three amendments shows this to have been inevitably incident to the nature of the 14th. The 13th and 15th were simple and direct in terms, each covering a single question. Article IV of the Constitution declared the citizens of each State entitled to all the privileges and immunities of citizens in the several States. Article V of the amendments declared that no person should be deprived of life, liberty or property without due process of law. But Article V was operative upon the general government, not upon the States. The 14th Amendment for the first time defined national citizenship, and endowed it with the privileges and immunities hitherto the attributes of citizens of the States. It then went further,

and prohibited the States from abridging these privileges and immunities in their new and broadened application. It borrowed and brought forward from the 5th Amendment the guaranty of due process of law, and decreed that henceforth the denial thereof should also be beyond the province of the State. In their new relation, the questions, What are the privileges and immunities of citizens? What is due process of law? and What the equal protection of the laws? are capable of being raised under an almost infinite variety of circumstances. They assume a new significance, and issues of consequence and moment are involved in their determination.

The amendment of which this first section is the most important part, was formulated by a Congress which convened almost before the din of war had died away. It was written of it, by the Speaker of its House, that "Its key-note of policy was protection to the down-trodden." Some members of that body may have been gifted with the prescience to see beyond the strife and partisanship of the hour,—but these were few. Such as they may have realized the true import of the measure thus wrought out in the heat and bitterness of debate. One or two did indeed predict its future. But of the many whose voices gave it the sanctity of constitutional law with truth it may be said that only the freedman was in their view. The first case which involved the interpretation of this amendment by the Supreme Court disclosed this view of restricted application. This was in the famous Slaughter House Cases, decided 14 April 1873. In behalf of the majority of the court, Mr. Justice Miller expressed this opinion: "We doubt very much whether any action of a State not directed by way of discrimination against the negroes as a class, or on account of their race, will ever be held to come within the purview of this provision. It is so clearly a provision for that race and that emergency, that a strong case would be necessary for its application to any other." But the Constitution was "made to march" during the succeeding quarter-century. In 1898, in Holden *v.* Hardy, we find the court declaring that "A majority of the cases which have since arisen have turned not upon a denial to the colored race of rights therein secured to them, but upon alleged discriminations in matters entirely outside of the political relations of the parties aggrieved." Doubtless it would be a pleasing reflection that the later and larger interpretation of this Amendment was the one contemplated by its framers. But this would not be warranted by the facts. The decisions nearest the amendment in point of time are nearest also to the intent of most of those who gave it life. The measure would scarcely have appealed to men from the Pacific coast had they foreseen the construction to be placed upon their work in the cases of Yick Wo *v.* Hopkins and the United States *v.* Wong Kim Ark. In the case of Yick Wo, Chinese, as "persons," were held to be entitled to "due process of law." In Wong Kim Ark it was held that children born in the United States of Chinese parents having their domicile here, are citizens of the United States. The effect of the former of these decisions was to give to the word "person" the broadest possible significance, as meaning every natural person within the jurisdiction of a State. But there was another class of persons to claim the protection of the amendment. Corporations came forward with the sound argument that they were mere associations of persons, each of whom was guaranteed due process of law and the equal protection of the laws, and that in their corporate capacity, as artificial persons, they were entitled to the same protection. Not until the lapse of 18 years after the adoption of the amendment were these artificial persons clearly held to be within the purview of its first section. This was in 1886, in Santa Clara County *v.* Southern Pacific Railroad. Since that time, of the cases involving the construction of this amendment, those in which corporations are interested probably outnumber all others combined. The courts have quite clearly distinguished, however, one important difference between these artificial persons and citizens. Privileges and immunities are held to belong only to the latter. Corporations must rely for their protection under the 14th Amendment upon their character as persons.

The Civil Rights Cases furnish the most striking instance of the difference between the interpretation placed upon the 14th Amendment by those who framed it, and that of the court whose province it is to construe its meaning and determine its powers and limitations. These cases, which were decided in 1883, arose through certain alleged violations of the first and second sections of the Civil Rights Act of 1875. It will be recalled that this act declared all persons entitled to the equal accommodations of hotels, theatres and public conveyances. It also provided certain penalties for the denial of these privileges "to any citizens, except for reasons by law applicable to citizens of any race and color." The court held that these two sections of the act were unconstitutional and void. They were held to be "direct and primary, as distinguished from corrective, legislation," and as such constituted an invasion of the domain of State control of its purely domestic affairs. The court placed upon the amendment the important and far reaching construction that it operated as an inhibition upon the States alone, and not upon their citizens. In the words of Mr. Justice Bradley: "Civil rights, such as are guaranteed by the Constitution against State aggression, cannot be impaired by the wrongful acts of individuals unsupported by State authority." Two other important interpretations of the 14th Amendment are that "equal" does not necessarily mean "identical," as applied to rights and privileges, and that the amendment created no new "privileges or immunities." Under the former have been upheld State laws which provided separate schools for the two races, and also those requiring railroads to provide "separate but equal" accommodations. Under the latter of these interpretations the court has held that women, as citizens of the United States, have no privileges to which citizens were not entitled before the amendment. Hence a State statute prohibiting women from voting or practising law was not an abridgment of the privileges of citizens within the purview of the amendment. If considered from the narrow viewpoint of a mere attempt to endow one race with privileges and immunities enjoyed by another, the interpretation of the 14th Amendment

has fallen short of the hopes and expectations of many of its advocates. The first section is now all of real significance that remains of the amendment. Held within its proper bounds, and wisely interpreted as it has been, this wears no longer the aspect of an instrument in derogation of the dignity of the States. As an effort to render more secure to all persons life, liberty and property, it stands forth in some measure worthy of rank with the ten great amendments which constitute the American Bill of Rights.

Of the 15th Amendment it may be said, as Mr. Justice Miller said of the 13th: "Its two short sections seem hardly to admit of construction." Of itself it confers suffrage upon no one. Save upon the grounds of race, color and previous condition of servitude, it does not diminish the right of the State to regulate the suffrage of its citizens. The power to impose any other qualification remains as it was before 1870. This has been held clearly enough in the few cases involving the right of suffrage abridgment thus far presented to the court. For one section of the country at least, harassed by problems peculiar to itself, it is well that this is so. See CONSTITUTION OF THE UNITED STATES; also UNITED STATES — INTERPRETATION OF THE CONSTITUTION.

ALFRED HOLT STONE,
Washington, D. C.

41. United States — State Constitutions of (1789-1904). The American Union is composed of 45 States or commonwealths, each of which has a body of fundamental law known as a constitution. The sphere of governmental activity which may be covered by the State, has been negatively defined in the Constitution of the United States (Article X. of the amendments): "The powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the States respectively or to the people." Among these powers which thus inhere in the people of the several States are those of determining the form which their own government shall take, with the sole provision that it must be republican in form, and of drafting their own fundamental law, subject to limitations imposed by the Federal Constitution.

Within the limits of the power thus defined, the State is supreme and in no way subordinate to the national government. The vast scope and sovereign character of this State activity seemed to substantiate the doctrine of State sovereignty. But the Civil War definitely and finally decided that the State is not sovereign, although it exercises many of the powers usually regarded as sovereign. The accepted interpretation of the relation of State and Federal governments under the Constitution is, that neither is sovereign. The people of the United States are alone sovereign. They have made both the Federal Government and the States their agents for certain specified purposes, and for those purposes each is supreme and uncontrollable by the other. The organs of the State are concerned solely with those powers reserved to the States, and do not possess and cannot have imposed upon them by the Federal Government, duties which are given by the Constitution of the United States to that government. The Constitution of the United States places upon the State a few, but very few, duties in connection with the conduct of the Federal Government. The most important of these are those of electing the United States senators; of conducting the election of presidential electors, and of members of the House of Representatives; and of providing a militia for federal use in certain contingencies. Disregarding, for the purpose in hand, these limitations and exceptions, we may treat the State Constitutions as if they operated within the several States to the exclusion of all other authority.

The closing years of the colonial period saw the 13 colonies in the possession of constitutions, either written or unwritten, which were in most respects essentially similar and which were, on the whole, well adapted to the needs of the inhabitants. The severance of the political ties which had bound the colonies to Great Britain made necessary the adoption of bodies of fundamental law for the new States. With the exception of Rhode Island and Connecticut, all of the original States had adopted new constitutions when the present Federal Constitution went into effect. In Massachusetts, a convention (1780) draughted a constitution and submitted it to the people for ratification. New Hampshire adopted her first constitution (1776) without popular ratification, but submitted a second constitution, drawn up by a convention, to the people, by whom it was adopted in 1784. Rhode Island and Connecticut, whose colonial charters granted in 1662 and 1663, needed few changes to adapt them to the needs of statehood, did little more than to substitute the name of the people for that of the king and continued these documents as their constitutional law until 1842 and 1818 respectively. In the remaining nine States the constitutions were in every case adopted by conventions, without submission to popular vote, although in only one State, Delaware, had the convention received a formal mandate for so doing. In each of these States, except Delaware, the convention exercised the powers of a legislature as well as those of a constitutional convention. These revolutionary constitutions were very short and most of them hastily constructed. They contained little besides a bill of rights and an outline of the frame of government. Their chief purpose was to define the fundamental principles of civil liberty and "to distribute all, rather than to withhold any, of the powers of government."

The history of the colonial period had taught the people that the legislature was the protector of their rights and liberties and that the other two departments were to be feared and guarded against as the representatives of the English crown; hence, in framing their new constitutions they gave predominent weight to the legislature, and defended the rights of the people against executive and judicial encroachment by provisions in their declarations of rights and further by subordinating both, and especially the former, to the legislature. In eight of the original States, the governor was appointed by the legislature and in Massachusetts alone did he receive the veto power. The highest judges were in no case elected by the people. In nine States they were chosen by the legislatures, in three by the executive and council and in one by the executive council alone. The possession of a freehold or the payment of a tax were qualifications required of all voters, with a few minor exceptions, as in Rhode Island, where the eldest

son of a voter who qualified by the possession of property of the value of $2,000 or of $100 a year, could vote, or in Pennsylvania, where the sons of a tax-paying voter were likewise privileged to vote. South Carolina alone imposed a religious qualification: belief in God. In the five States where the governor was elected by the people, a higher property qualification was demanded for the electoral franchise in voting for governor than for members of the legislature. Nearly all of the States required additional qualifications for office holding. In six States, property qualifications, ranging from a freehold to $50,000, were demanded of the governor and six prescribed a religious qualification for the same office. New Hampshire, Maryland and North Carolina permitted none but Protestants to occupy the governor's chair; Massachusetts none but Christians, while Delaware made belief in the Trinity, and Pennsylvania and North Carolina belief in God and in the divine authority of the Bible, necessary qualifications.

Three well defined periods can be traced in the development of American State constitutions since the Revolution: (1) From the Revolution to the War of 1812; (2) From the War of 1812 to the Civil War; (3) From the Civil War to the present time. The first period may be characterized as that in which the legislature was supreme. The legislature, historically the guardian of popular rights against the British government, continued to be regarded as the best and safest repository of power. The strong colonial executive was replaced by a governor having very slight administrative duties and even less discretionary power. He was elected by the legislature in most of the States, had the veto power only in Massachusetts and was unable to adjourn, prorogue or dissolve the legislature. The constitutions were based upon a belief that the people had nothing to fear from the legislature, but that they should be safe-guarded against the executive and judiciary. The second period experienced most far-reaching political and social changes in the United States. Democracy was everywhere triumphant and American political institutions, including State constitutions, were very thoroughly democratized. The earlier period placed marked limitations upon the privilege of voting, while the second nearly everywhere granted manhood suffrage to whites. State governors and judges were generally elected and the judicial term was shortened. The governor began to acquire the veto power. The confidence reposed in the legislature had been, in a sense, misplaced. In the early part of the second period there was much reckless management of the finances, money was squandered on the most chimerical schemes for internal improvements, charters were granted for banking institutions that had little or no capital, special legislation of the worst sort was passed, monopolies were created, appointments controlled, unmerited exemption from taxation was voted, and laws were even passed for the purpose of affecting cases pending in the law courts. The day of reckoning came in 1837 and since that time there has been a constant tendency to check and limit the powers of the legislature. The revolutionary practice of adopting constitutions in State constitutional conventions, without ratification by popular vote, gave place to the direct reference of constitutions and their amendments to the people at the polls. The desire to narrow the field of legislative competence was further evidenced by the adoption of amendments limiting its authority over specified fields. Few important changes in the principles of State constitutional law took place before the Civil War. The chief improvements were of an administrative character. The Civil War, which marks the beginning of the third period, brought about a radical readjustment of economic and industrial conditions throughout the United States, and, in addition, effected a complete change in political conditions in the Southern States. The predominant characteristic of this period has been a continued and increasing distrust of the State legislatures, which has resulted in very marked limitations of their powers. These have been effected chiefly in two ways. First, the field of legislative activities has been decreased by prohibiting the passage of certain laws or classes of laws; by direct legislation by means of constitutional amendments in matters formerly controlled by the legislature; and by requiring popular approval, at the polls, of certain legislative measures, before they can be enacted as laws. Second, the powers of the governor and judges have largely increased. The governor's term which was, at first, annual in all but three States, has been greatly lengthened and is now annual in two only, while nearly half the States have a four-year term. His power has been further enhanced at the expense of the legislature by an almost universal grant of the veto, only three States withholding this power and 26 granting, in addition, the power to veto items of an appropriation bill. The State of Washington even allows the executive to veto items of any bill and the governor of Pennsylvania can approve such portion of an item of an appropriation bill as he sees fit. In 1901, he vetoed 47 and cut down or partly vetoed 132 other items of appropriation measures. The executive appointing power has been materially augmented and the power to pardon and reprieve has been nearly everywhere granted. These changes are indicative of a growth in the conconfidence placed by the people in the governor, which is the most important source of his increased power. This confidence has been engendered by the fact that responsibility can be fixed upon the single executive, as it cannot be upon the legislature, which is, under our American system, without responsible leadership. The judicial office, although based in a large majority of cases upon popular election, has had its term materially increased in this period.

Another evidence of the increasing lack of confidence in the legislature is the limitation of the time during which the legislature can sit. This has been accomplished by decreasing the frequency and by limiting the duration of the sessions. Public opinion has traveled far from that of the revolutionary period, which was expressed in the so-called axiom of political science: "Where annual sessions end tyranny begins." Six States only, and all of them of the original 13, retain annual sessions. Alabama, in her recent constitution, has prescribed a quadrennial session. Twenty-nine States limit the duration of the session to from 40 to 90 days. This attitude of the people is further shown by numerous constitutional provisions adopted for the purpose of preventing the railroading and

fraudulent passage of bills, especially during the closing days of the session. For example, in New York, no bill may be passed or become a law unless it is printed and lies, in its final form, for at least three calendar legislative days upon the desks of the members, unless the governor certifies to the need of its immediate passage; and no amendment is allowed on the last reading of a bill. Other provisions attempt to prevent or punish bribery and make impossible the appointment of a legislator to any civil office during the term for which he is elected.

The rapid growth of State debts during the half century preceding 1870 was another cause of great dissatisfaction with the legislatures. The total State indebtedness in 1825 was $12,790,728, in 1870, it had risen to the portentous sum of $352,866,898. Drastic measures were taken by a large number of States to prevent further squandering of the people's money by their representatives, with such success that the total of State indebtedness has been reduced to about $172,000,000 (1904). Most States forbid the legislature to contract debt for more than a maximum amount fixed by the constitution. (For example, $50,000 in Oregon; $1,000,000 in Pennsylvania.) New York State allows the legislature to issue deficiency bonds, not to exceed $1,000,000, and to contract debt for the purpose of repelling invasion or of suppressing insurrection, but for all other purposes the approval of the voters is necessary before a loan can be contracted. Moreover, nearly every State requires that a sinking fund be established for every bonded loan issued.

This distrust of the legislature is traceable to several causes. State legislation has been frequently hasty and ill-advised. In New York from 1895 to 1904 the courts pronounced 41 laws, passed by the legislature, unconstitutional. Special legislation has engrossed the attention of the legislators and has often been so obviously opposed to the general welfare that public opinion has imputed the worst of motives to the members. The people are convinced that the party "boss" controls the legislature, the members of which merely register his will; and that he orders measures passed for partisan or corrupt purposes. The second of these reasons is unquestionably the most influential. A vast majority of the laws passed in the average legislature concern local or special interests. Eight typical States, in 1901, passed a total of 7,032 statutes, of which 5,876 were of local or special import. The objections to this class of legislation are two-fold. First: the time and interest of the members are so largely occupied with the work of obtaining legislative favors for political and personal friends that insufficient time and attention are give to bills of a general character whose effect upon the private or political fortunes of the legislators may not be so intimate. Second: special legislation, particularly for corporate interests, gives ample opportunity for bribery and corruption, which, although doubtless not so great as is often charged, is commonly believed by public opinion to be associated with the passage of such measures. Perhaps an even greater evil is the constant changing and amending of city charters and other local government laws in the interests of the "boss" or party which controls the legislature, or of influential public service corporations. Sometimes an entire city government has been legislated out of office, as in the Pennsylvania "Ripper" Act of 1902. To check this abuse, 36 States have adopted constitutional provisions forbidding special or local legislation. These provisions vary greatly. Some of them are very sweeping and stringent and others have not been carefully enough draughted to prevent the continuance of the practices they were intended to abolish. The most common of these provisions require incorporation under a general law; prescribe legislative auditing of private claims; prohibit exemption from taxation, except under general laws; forbid the passage of acts, except as general laws for the chartering and government of cities and towns and, in the realm of purely private law, interdict legislative divorce and legislative admission to the bar.

The result of the presence, in the constitution, of this great mass of matter, either directly or indirectly restrictive of the powers of the legislature, has been to abolish the distinction in character which formerly existed between constitutional and statue law, and to incorporate in the body of supposedly fundamental law details that more properly belong in a statute or even in an administrative ordinance and thus enormously to increase the size of the constitution. It must be remembered that the State legislature is not, like Congress, a body exercising only delegated powers. Any power within the competence of the State it can legislate upon, unless forbidden by the constitution; hence any limitation of its power must be expressly stated in the constitution. This is the reason why distrust of the legislature has caused such an increase in the size of our State constitutions.

The frequent and lengthy additions to our State constitutions are themselves a fruitful source of further amendment, for the more elaborated the fundamental law is in a growing civilization, the more frequent will the changes be. Dealing, as they do, often in minute detail, with a large range of subjects, constant revision is necessary to remedy defects and to meet the needs imposed by changing conditions. The New Hampshire constitution of 1776, excluding the preamble, contained 600 words; the present constitution of Missouri or South Dakota contain over 50 times as many.

Constitution making has been most active in the West and South. Economic and social changes have been the chief causes in the West, while in the South, the Civil War and the successive attempts at a settlement of political problems have occasioned the frequent adoption of entirely new constitutions. Massachusetts has lived, since the Revolution, under the constitution of 1780; but several of the Southern States have adopted five and six entirely new constitutions in addition to numerous amendments. Nine new constitutions were adopted, and two were rejected, during the period from 1890 to 1903, and in the shorter period from 1895 to 1903, 284 amendments were proposed and 168 adopted. Practically every State has made some change in its constitution within the last ten years.

The method of amendment varies in the different States. The practice of submitting fundamental law to the voters for adoption had been almost universally in vogue, except in the Con-

federate States, for about three quarters of a century before 1890, but while the North and West still make this method obligatory, six Southern States, largely influenced by the negro problem, have recently promulgated new constitutions by act of the constitutional convention without popular ratification. In all but 12 of the States, constitutional provision is made for calling conventions for the purpose of general revision of the constitutions. The legislatures in most of these States, if their action is supported by the voters at the polls, can call conventions. Several make obligatory the submission to the people, at stated intervals (N. Y., Md., Va., O., 20, Mich., 16, Ia., 10, and N. H., 7, years) of the question whether a convention is desired or not. Every State, save New Hampshire, makes provision for ordinary amendment by legislative initiative and in all of these, except Delaware, by submission to the voters for ratification. In Delaware only, is the legislature, acting by two thirds majorities for two successive legislatives, competent to adopt a constitutional amendment without popular vote. South Carolina and Mississippi have the unique method of requiring an amendment, which has been proposed by two thirds of each house of the legislature and approved at the polls, to be further ratified by a majority of each house at the next legislature. Twenty-eight States allow one legislature, generally by a two thirds vote of each house, to propose amendments. In 12, two successive legislatures must each adopt the proposed amendment before submission to the people. A majority of votes cast is sufficient for adoption in all but three States. Rhode Island requires a majority of three fifths of the votes cast, while Missouri and Wyoming prescribe a majority of all the voters of the State.

After the grant of the franchise to the negro during reconstruction, the ideal of manhood suffrage was very nearly attained. Recent years, however, have shown a tendency to restrict the franchise. Seven of the Southern States have adopted restrictions (six of them constitutional), which were primarily designed to deprive the negro of the right to vote and which have, in spirit at least, annulled the 15th amendment. Even when the race problem is not involved, there is a tendency to place a higher value on the elective franchise. An increasing number of States are restricting the privilege to citizens of the United States (only about one fourth now permit aliens to vote), and a number of recent constitutions have imposed the qualification of ability to read and write English. In all, 13 States have an educational qualification, in several alternative with a property qualification.

The typical State Constitution contains: (1) A definition of boundaries, except in the older States; (2) A bill of rights; (3) A frame of government; (4) A great mass of miscellaneous provisions, arranged with slight regard for logical classification, "relating to administration and law, including articles treating of education, of the militia, of taxation and revenue, of the public debts, of local government, of State prisons and hospitals, of agriculture, of labor, of impeachment and of the method of amending the constitution, besides other matters still less political in their character"; (6) The schedule, which contains temporary provisions about putting the constitution into effect.

A bill or declaration of rights, historically the most important part of the document, is found in every State Constitution, except Michigan's, where there is no separate bill of rights. It contains those fundamental guarantees of personal liberty, the most prized heritage of our race, which are most familiar through incorporation in the Federal Constitution, and in addition, many provisions, widely dissimilar in the several constitutions, defining supposedly inherent rights of the individual. The bill of rights of the Federal Constitution restricts the Federal Government alone; hence the necessity for the incorporation of a bill of rights in the State Constitution. Mention will be made of one only of the rights thus secured to the citizen. Religious liberty, in its fullest sense, was not a possession of all people in the American States during the early years of national independence. Connecticut did not abolish her established church until 1818 and that of Massachusetts was not fully disestablished until 1833. At the present time all States have constitutional guarantees of freedom of conscience, of expression of religious opinion, of worship or of non-worship and of equality of all religious denominations in the eyes of the law; although the Christian religion is by the common law recognized as the prevailing religion of the country, as is witnessed by the laws of blasphemy and of observance of the Christian Sabbath.

The frame of State government is strikingly similar throughout the Union. Each provides for an executive department consisting of a governor, a lieutenant-governor in most States, and heads of the important departments of administration (Secretary of State, treasurer, comptroller, attorney-general, etc.), elected in nearly all of the States and constituting, with the governor, what is in reality an executive in commission. While in the Federal Government the President is *the* executive, the State governor is merely a part of the executive; a number of the most important heads of departments being nearly or quite independent of the governor, although in some States subject to removal from office for cause shown. They are practically colleagues, not subordinates, of the governor. Executive decentralization is the rule; a rule still further enforced by the creation of large numbers of administrative boards and commissions, all of which are created by law and have their duties prescribed by the legislature and, whether appointed by the governor or not, are in practice very little under his control. A number of State governors have, in recent years, called attention to the defects of such excessive decentralization and have asked the legislatures to devise remedies for what they deem a growing evil. The governor's power of appointment is in most States small and his actual control of administration is even less. His greatest power and responsibility are derived from the possession of the veto and the marked increase in recent years in the influence of the gubernatorial office has been due to the governor's share in legislative power and hardly at all to his executive and administrative functions.

The legislature is everywhere bicameral. Two houses exist because the American people believe that the bicameral system embodies a sound principle of political science and not because special classes, or elements of the body politic,

can thereby obtain a share in government; for everywhere, except in Rhode Island and Connecticut, representation in both houses is based upon population, the only difference being that the senatorial district is the larger. The town is the basis of representation in the senate of Rhode Island and in the House of Representatives of Connecticut. Although over one half of the States give the initiation of money bills to the lower house, there is no sufficient reason for such discrimination. The practice is a survival of colonial custom or is a meaningless copy of Federal or English precedent. In other matters the powers of the two houses are in general identical, except in the process of impeachment and in some States the senate has the power of confirming executive appointments. The committee system, modeled closely after that of Congress, is everywhere in use and rules and procedure are practically the same as the Congressional. The governor and heads of departments never occupy seats in the legislature and the English system of government through a premier, who is subject to a parliamentary majority, has never found lodgment in the United States.

The organization of the judicial department varies somewhat in the several States, although the difference is rather in the degree of development than in the principle of organization. Most States have at the head of their system a single court of appellate jurisdiction, called, generally, the supreme court, sometimes the court of appeals; and a superior or circuit court of highest original jurisdiction. Lower courts consist of county and local courts of inferior jurisdiction. In New York, whose judiciary may be taken as an example of more highly organized systems, which obtain in some of the larger States, the State courts consist of a court of appeals, four appellate divisions of the supreme court, with justices assigned from the supreme court, and the supreme court of 76 judges, county courts, except in New York County, and courts of the justice of the peace. The cities of the State have special municipal courts. In counties having a population of 40,000 or over there is a surrogate's court for probate jurisdiction. Separate chancery courts, which were found in nearly all of the original States, were regarded as inconsistent with the democratic spirit of the age and now exist in a few only of the older commonwealths. Equity jurisdiction is, however, administered in all of the other States by the regular judges of the law.

Georgia was the only revolutionary State to vest the election of judges with the people. Six gave the choice to the legislature and in the remaining six, the governor, with the consent of the council (in Delaware of the legislature), made the appointment. The strong democratic wave which swept over this country in the early part of the 19th century, affected the judicial office by very generally transferring the election to the people and by adopting a short term in place of the life tenure of the early period. There are now 34 States which vest the election of the higher judges in the people, while minor judges are even more generally elected. The governor appoints in six States, subject to the approval of the council or senate. In Connecticut, the governor nominates and the legislature elects. In Rhode Island, Vermont, Virginia and South Carolina the legislature both nominates and elects the judges. Massachusetts, Rhode Island and New Hampshire (until 70 years of age), alone retain life tenure. The term in Pennsylvania is 21 years, in Maryland, 15, and in New York, 14. Vermont has the shortest term, two years, while the average is from six to eight years. Judicial salaries have been considerably increased of late, but in many States are still altogether too low to command the best or even thoroughly qualified men. They range from $2,000, in Vermont to $17,500 for supreme court judges in New York city, which is the highest judicial salary paid in America. The average for supreme court judges is about $5,000. In some States judges are removable by impeachment and in others by an address of both houses of the legislature, a two thirds vote generally being necessary.

The local government divisions of the State are the creation of the legislature, which, unless expressly restrained by the constitution, can make and change them as it pleases. Legally they are political divisions erected by the legislature for the purpose of assisting in the government of the State. Historically the principle of local self government lies deeply embedded in our political life and this fact has been recognized in several recent constitutional enactments, which limit the hitherto unrestricted control of local government by the legislature, notably in California where cities have the right to frame their own charters.

Two among the numerous miscellaneous provisions of the modern State Constitution deserve especial mention: those dealing with education and with the control of corporations. Formerly education was a purely local concern, but the increasing recognition of the political importance of education in a democracy has led the State to grant extensive aid and to assume a large degree of control. Practically all of the States now have a State superintendent or commissioner, generally elected and nearly always a constitutional officer, and State boards of education. All but a few of the older States, in addition to financial assistance to primary and secondary schools, maintain State universities. So vital is the subject considered that the people embody the most important regulations in the constitution. Even the revenues for the support of the universities are secured beyond the chance of hostile legislation by a constitutionally fixed rate of taxation.

The growth of great transportation and industrial corporations in recent years has been the cause of a vast amount of restrictive and regulative legislation. Popular fear of the railroad combination and of the industrial trust, and distrust of the legislature as an efficient and incorruptible agent for dealing with capitalistic monopolies, have led the voters in 19 States to incorporate provisions in their constitutions forbidding the combination of competing railroad and telegraph lines, while anti-combination laws have been passed by 16 of the remaining States. The lack of power to regulate interstate commerce has made most of these efforts at control of transportation ineffective and a demand for more effective congressional legislation has consequently arisen. Anti-trust agitation has been so wide-spread that 30 States have now passed laws against trusts, and of this number,

about one half have anti-trust clauses in their constitutions. Nearly 40 States have provisions against monopolies, either in constitution or statute, and every State of the Union has found the regulation of corporations necessary. The subject of corporation control has aroused more interest than any other question that has been before the American people since the era of reconstruction. Even in the recently adopted southern constitutions, the control of corporations was second only to the disenfranchisement of the negro as an object of popular desire. See CONSTITUTION OF THE UNITED STATES; GOVERNMENT.

Bibliography.— Bryce, 'The American Commonwealth'; Hitchcock, 'American State Constitutions'; Stimson, 'American Statute Law'; Cooley, 'Constitutional Limitations'; Jameson, 'Constitutional Conventions'; Poore, 'Charters and Constitution' (to 1878); 'New York Constitutional Convention Manual' (constitutions in force in 1894); Oberholtzer, 'The Referendum in America'; Borgeaud, 'Adoption and Amendment of Constitutions'; Whitten, 'Trend of Legislation in the United States'; Boone, 'Education in the United States'; Draper, 'Educational Organization and Administration' in Butler, 'Education in the United States'; Horack, 'The Organization and Control of Industrial Corporations'; Clark, 'The Control of Trusts'; Jenks, 'The Trust Problem'; Cook, 'Corporations as Affected by Statutes and Constitutions.'

MARSHALL S. BROWN,
Professor of History, New York University.

42. United States — The War with Spain. The Spanish-American War of 1898 was the outcome of conditions set up in Cuba by the political discontent in the island during nearly the whole of the 19th century, varied in the latter half by long continued revolts. The United States government, controlled as it was in the earlier half of the century by the slave interests of the South, had desired and made overtures at intervals to annex the island. But this wish disappeared with the changed conditions brought by the Civil War. There was no longer a reason through desire to extend slave territory, and the annexation of a large alien population, much of which was colored, was repellant. The ten years' war in Cuba, which began in 1868 through the refusal of Spain to accede to plainly necessary reforms, had been ended by promises from Spain which were not kept. Revolt thenceforward was passive rather than active, but sure in time to break into activity, which it did in 1895. The commercial and social conditions begotten by chronic strife through so many years wrought not only upon the sympathies of the United States, but generated ill feeling which must always come when trade interests are deeply injured. Large property interests in the island itself were held by Americans, many of whom suffered most severely. By the end of 1897 the island had been brought to the verge of ruin. The insurgents, always strong in the east, had raided the west, burning canefields and destroying plantation buildings in the attempt to create a desolation which would make Cuba valueless to Spain. The Peninsular Government with more than 200,000 men in the island was making no headway against the insurgents. It had become clear, as Consul-General Lee reported to his government, that Spain was powerless to suppress the revolt, and the insurgents equally powerless against the Spanish occupation. A large proportion of the rural population had been brought within the Spanish lines by a decree of Governor-General Weyler, issued early in 1897. But the Spanish authorities could feed neither them nor their own troops. Destitution, starvation, and death to an appalling degree was the result; cultivation outside the Spanish lines practically ceased; the commonest necessaries of life had to be imported. Spain looked upon the situation as due largely to American sympathies and aid. No doubt the dogged persistence of the insurgents was due in a considerable degree to hopes of American intervention, but the fact is that the American government loyally did its duty in suppressing unlawful attempts to send aid from its territory. It could not suppress the general sentiment of the country for a much suffering population. The American government thus felt called upon to insist upon reforms which would restore something like the normal conditions of human society, and this pressure, united with the action of the Spanish liberals, caused to be enacted the law signed by the Queen Regent, November 1897, establishing a system of Cuban autonomy. General Blanco was sent in the beginning of 1898 as governor-general with the avowed object of pacification upon such lines. But the Spaniards and their friends in Cuba were opposed to the scheme as granting too much; the insurgents, as granting too little. Nor were the latter willing to continue the dominancy of Spain at any price. Nothing short of independence would be listened to. The attempt was thus doomed to failure. January 1898 was marked by serious military riots in Havana due to the opposition of the Spanish party to Blanco. In consequence of the supposed danger from these disturbances to American citizens, the Maine, which had been for some time at Key West and vicinity, engaged in looking after filibustering attempts, was sent to Havana. Her arrival gave fast offense. She dominated the city from her anchorage, and her coming was thus looked upon as a threat. Her destruction, 15 February, naturally laid by the American public at the door of the Spaniards, brought a state of excitement which, combined with the previous feeling, made war dangerously near. The Court of Inquiry of which Admiral (then Captain) Sampson was president, after sitting more than a month, rendered a finding that her destruction was due to an exterior mine. This finding was chiefly based upon the extraordinary manner in which the keel was forced up at the centre of the explosive effort, 34 feet above its normal position. As the ship settled but from four to six feet before touching bottom, it would seem impossible that any launching forward of the after body could have produced such an effect. Two other considerations add weight to the board's finding; the first, that the only ship of the American navy ever so destroyed had to wait to arrive in an unfriendly port before the catastrophe should be accomplished; the second, the wholly different effects of the explosion of the forward magazine of the Oquendo after the Santiago action. The finding of the board in no way implicated the Spanish government, and the writer, as a member of the board, can state explicitly that no member of the board held

such a view. It should be added that the very cursory and untrustworthy examination by the Spanish divers is shown by their report that the keel appeared to be intact.

Events thenceforward marched rapidly. Congress and the people of the United States both became very hostile in sentiment to Spain. As early as January the government had taken steps to cover eventualities, as far as the navy was concerned, by ordering that the time expired men should be retained, and after the Maine disaster, ships were concentrated; the North Atlantic squadron at Key West, the Asiatic squadron at Hongkong (ordered 25 February). Congress 9 March voted $50,000,000 for national defense; merchant vessels and yachts were purchased and armed; colliers and two hospital ships equipped; the four large ships of the American line taken over for service, and the two cruisers built at Elswick for Brazil, purchased and renamed the New Orleans and Albany; the latter, however, was not far enough advanced to be used during the war. An American merchant ship which had been converted into a cruiser by Brazil was also bought, as also the Diogenes of 1,800 tons, built for Peru and never delivered, renamed Topeka; a small torpedo boat purchased in Germany and named the Somers, which did not reach the United States until after the war. The treasury department turned over to the navy 15 revenue cutters and four lighthouse tenders, all of which did good service. Coal in quantities was forwarded to Key West, which rapidly assumed the prominence of an important naval base, the command of which was assigned to Commodore Remey. A squadron was formed at Hampton Roads of the Brooklyn (flag), and battleships Massachusetts and Texas, denominated the flying squadron with Commodore W. S. Schley in command.

The two navies stood as follows:

	United States		Spain	
	Nominal	Effective	Nominal	Effective
Battleships	5*	5	1	0
Armored Cruisers	2	2	6	4
Monitors	6	6	2†	
Protected Cruisers	13	8	5	4
Unprotected cruisers and gunboats	21	20	9	5
Torpedo gun vessels	1	1	11	10
Torpedo boat destroyers	0	0	6	6
Torpedo boats	6	6	12	3
Small gunboats	0	0	84‡	?

* One second class.
† Old iron-clads done over — non-effective.
‡ All but 20 of these last under 200 tons.

The war was necessarily to be mainly naval. Whoever should control the sea would win. Spain could only hold Cuba by being able to send thither troops and supplies. As Mahan well says: "A million of the best soldiers would have been powerless in face of hostile control of the sea." The United States could not invade Cuba unless the navy was strong enough to control the neighboring waters and make transport to and fro perfectly safe. Spain had, in the squadron under Rear Admiral Cervera, four fine armored ships of 20 knot speed and good armament, with which in speed and armament the United States had but two to cope, the New York and Brooklyn. So long as this squadron existed, Spain had a powerful military asset which would aid the war's continuance. The Carlos V. of like character was also counted, even by the Spanish Minister of Marine, as available, as also the Pelayo, a second-class battleship, overhauling at La Seyne (near Toulon) where she had been built. In the East were two squadrons, facing one another, but neither was of a character to play a decisive part in such a war; neither could face a squadron of armored ships without expecting destruction. The disquieting element to the United States was thus Cervera's squadron which it was expected at the time would be increased by at least the two other armored ships mentioned; and it was a reasonable disquiet. It was very possible for this squadron to have appeared upon the United States coast, causing much apprehension and some damage and to have taken refuge in Havana, to emerge again under the guns of what became, as time went on, powerful batteries. But as we know from Admiral Cervera's reports, the inefficiency of his ships made such action hopeless. Spain had started a small torpedo flotilla to Cuba in early March, but the sea was too rough for the smaller boats and all took refuge at the Cape Verdes, returning later, except the three torpedo boat destroyers, to Spain. The Vizcaya had been sent to New York in February as an offset to the visit of the Maine to Havana, whither she shortly went. She was joined there by her sister ship, the Oquendo, the arrival of the two adding greatly to the enthusiasm of the Spanish party. But this action was ill considered. Neither ship had been docked for many months, and when they left 1 April to go to the rendezvous east of Porto Rico to meet the expected torpedo flotilla and, failing the rendezvous, had to go to the Cape Verdes to join Cervera, they had crossed the Atlantic twice, had severely tried their engines and boilers, and had had no chance for a much needed overhauling of their machinery. They thus started on a third transatlantic journey, bottoms foul, machinery in bad condition and ill equipped in almost every respect except in gallant spirit, to meet a foe who was in the highest state of preparation. The advice and prophesies of Cervera were unheeded. When war had declared itself a large number of officers high in the navy met at Madrid 24 April and decided that his squadron should at once proceed to San Juan, Porto Rico, its later movements being left to his discretion. The decision revealed an utter lack of preconceived plan and ignorance of the conditions of the problem. The ultimatum signed by President McKinley 20 April 1898, demanding the withdrawal of Spain from Cuba was practically a declaration of war and the Spanish government sent the American minister his passport the next day without awaiting the presentation by him of the fateful resolution.

In the early morning of 22 April, Captain Sampson, then rear-admiral by the authority vested in the President in time of war, sailed with such of the ships as could be made ready to leave, with orders to blockade the Cuban ports. The ships at or near Key West which could be drawn upon for this first move were (armored) New York, Indiana, Iowa; (monitors) Puritan, Terror, Amphitrite; (cruisers)

Cincinnati, Marblehead, Detroit; (cruisers gunboats) Wilmington, Machias, Castine, Nashville, Newport, Helena, Dolphin, and auxiliary Mayflower; (torpedo boats) Dupont, Porter, Foote, Winslow, Cushing, and Ericsson; (armed tugs) Nezinscot, Samoset, the armed lighthouse tender Mangrove and supply steamer Fern. By the afternoon of 23 May, 20 of these were on the blockade, which was established from Cardenas, 85 miles east of Havana to Bahia Honda, 55 miles west. It had been Sampson's wish to attack Havana at once and the order of battle was prepared, but the navy department refused consent, holding that the heavy ships should not be risked against batteries until the Spanish squadron should be met. This was undoubtedly correct in principle, but Sampson's knowledge of the conditions was more complete than that of the officials in Washington and the writer is of the opinion now as then, that had Sampson had his way he would have taken Havana at once, without loss or serious injury to his fleet. It was his intention to go within 800 yards of the batteries, the water being extremely deep to the shore itself; it would have been impossible for the men in the batteries, exposed as they were, to stand to their guns under the fire of the multitude of small guns carried by the small ships. Sampson yielded to the department's views with great reluctance. Commodore Dewey, who had relieved Rear Admiral McNair in command of the Asiatic Station had concentrated, by order of the department of 25 February, all the ships of his squadron at Hongkong.

His squadron was composed of the

	Tons	Speed	Main Armament	
Olympia	5,870	21.6	4–8″; 6–6″	10–5″
Baltimore	4,413	20.		
Raleigh	3,183	19.	1–6″; 2–8″; 6–6″	10–5″
Boston	3,000	15.5		
Concord	1,710	17.3		
Petrel	892	13.7	4–6″	

The ships carried also 36 6- and 3-pounders, 40 smaller guns and 19 torpedo tubes; the crews numbered 1,743 men. The revenue cutter McCulloch, lately arrived, had been joined to the squadron, but, lightly armed, could not be considered as adding to his fighting force. At Manila, under Rear Admiral Montojo, were available for aetion the

	Tons	Speed	Main Armament	
Reina Cristina	3,090	16.0	6–6.2″	
Castilla	3,342	0.	4–5.9″	2–4.7″
Don Antonio de Ulloa	1,152	14.	2–4.7″ *	
Don Juan de Austria	1,152	14.	4–4.7″	
Isla de Cuba	1,040	15.9	6–4.7″	
Isla de Luzon	1,040	15.9	6–4.7″	
Marques del Duero	500	10.	2–4.7″	

* This ship's machinery was under repair and the other two guns of her main battery were mounted, one at El Fraile, the other at Saugley Point.

Two 2.9″, two 2.7″, 27 6- and 3-pounders, 19 smaller guns and 17 torpedo tubes, with crews amounting to 1,695 men, were carried by the ships just mentioned. Besides there were the Velasco of 1,139 tons with two of her four guns at El Fraile and two gunboats, the Correo and General Lezo of 525 tons and three 4.7″ guns each. All these were under repairs and took no part in the coming action, the crew of the Velasco manning the hastily built batteries at the entrance of the bay 25 miles from Manila. The Castilla, a wooden ship, built in 1881, had to be towed, as she could not use her engines. It must be admitted that the Spanish outlook was a sorry one and fully as hopeless as the report of Admiral Montojo indicates it to have been in his own mind.

The Baltimore had arrived at Hongkong 22 April, and was allowed by the Hongkong authorties to be docked. On the 25 the British governor requested Dewey to leave, and the squadron went to Mirs Bay, 30 miles distant on the China coast, where it awaited the arrival of O. F. Williams, the American consul to Manila, whose local knowledge was regarded valuable. He came 27 April and that afternoon the squadron left in accordance with the navy department's telegram, sent 24 April, announcing that war had begun and directing Dewey to "commence operations at once, particularly against the Spanish fleet. You must capture vessels or destroy." The telegram ended "Use utmost endeavors," words which might have been spared. On the same day that the American squadron went to Mirs Bay, Montojo left with the Reina Cristina, Castilla, Don Juan de Austria, Isla de Cuba, Isla de Luzon and the Marques del Duero for Subig Bay, an excellent defensive point 50 miles distant from Manila, and one where batteries had been begun by Spanish army engineers. The bay was the site of a proposed new Spanish naval arsenal, some buildings for which had already been erected. Montojo towed the Castilla. Three vessels had been sunk in the eastern entrance to Subig Bay and it had been hoped to hold the western with the batteries and ships. But the batteries were not ready. The failure of the admiral to have this knowledge beforehand was in itself a startling instance of the inefficiency of Spanish administration. Receiving a telegram 28 April that Dewey had left for Manila, Montojo held a council and returned, mooring in a general east and west line in Cañacao Bay, just north of the spit on which was the small naval arsenal and village of Cavite and abreast the small batteries mounting, on the sea front 4.7″ B. L.; on Sangley Point two-5″ .87 B. L.; at Cavite three-6″.2 muzzle loading rifles. The Spanish squadron was as well off there as anywhere. These guns were much better placed to aid it than would have been the guns at Manila had he chosen to lie near the town. At and near Manila were 36 guns; none of these were of great range and most were ineffective. There were, however, four 9″.45 breech loaders and eight of 4″.2 and 5″.87 converted to breech loaders, but his squadron would have had to lie so far from shore that their range would have been insufficient to protect it against the high power guns of the Americans.

Dewey arrived off Subig the afternoon of 30 April, reconnoitred Subig with three of his ships, and informed his captains assembled in consultation of his intention (the Spanish ships not being found in Subig) to stand on slowly and arrive at Manila at daybreak. He stood for the Boca Grande. The mouth of the bay, which is half way between Subig and Manila, is 10 nautical miles broad and divided by the island

Corregidor two miles from the mainland on the north, which thus forms the Boca Chica (narrow mouth). On the north side of this entrance were two batteries, one (Punta Gorda) mounted 7″ muzzle loading rifles, the lower, two 6″.2 B. L. Hontoria rifles. On Corregidor itself were three 7″ muzzle loaders looking north. Two miles southeast of Corregidor is Caballo island on which were three 5.″87 B. L. Armstrong rifles. Three and a half miles from Caballo is El Fraile, on which was a battery of three naval 4.″7 guns taken, two from the General Lexo, one from the Don Antonio de Ulloa. All these batteries were built and manned by the navy. There were no torpedoes, the channel being too broad and deep for mining. The squadron naturally selected the broad passage between El Fraile and Caballo, which was reached at midnight. Signals from Corregidor showed that they were discovered and two shots were fired from El Fraile which were answered by three of the ships, and the squadron headed at slow speed for Manila, 25 miles distant. At 5.15 it was fired at from the Manila and Cavite batteries as it approached; the Spanish ships being sighted to the southward, the American squadron turned south and opened fire at 5.41. The ships moved in column three times west and two east, about parallel to the Spanish line and at ranges varying from 5,000 to 2,000 yards. At 7 the Spanish flagship made a futile effort to leave the line and attack, and at 7.35, it being erroneously reported that but 15 rounds per gun remained for the 5″ battery, the American squadron hauled off and the commanding officers called aboard the flagship for consultation. The crews were given breakfast. Nothing was known at the moment of the effect of the attack, but somewhat later this was evident when the two largest Spanish ships were seen to be afire. Being assured as to the ammunition supply, the attack was renewed at 11.16 and continued until 12.40 when the American squadron returned and anchored off Manila. The Reina Cristina, Castilla and Don Antonio de Ulloa had sunk; all the others were burned by a party sent in from the Petrel after resistance had ceased and the ships been abandoned. The Spanish loss was 167 killed and 214 wounded; there were of the Americans 7 slightly wounded. While the American squadron was much more powerful, the difference in character of ships and numbers of types of guns cannot account for this immunity from loss on the American side. All the ships were vulnerable to all but the very lightest of the Spanish guns. The only reasonable supposition is that the Spanish by want of practice and through temperamental excitability, could not shoot with any accuracy whatever. There was courage in abundance, but no training.

Dewey made no effort to capture the city of Manila, as he had no troops to hold it. No further firing took place. Cavite arsenal was taken possession of and a blockade of Manila established. He lifted and cut the telegraph cable, but the Hongkong office of the cable company refused to take his messages as vitiating its contract with the Spanish government. It was thus necessary to send a ship to Hongkong to cable thence. The McCulloch coaled and left 5 May, and arrived at Hongkong the 7th with the official information of the victory. There was a period of quiet waiting for the troops and ships, varied with rumors of the despatch a fleet from Spain and by the arrival of Aguinaldo and the organization of a Filipino army which was later to give much trouble. The first American troops, 2,500 in number, reached Luzon 30 June accompanied by the cruiser Charleston, which took over the surrender of Guam en route; the second expedition of 3,500 arrived 16 July. Dewey in the meantime was rendered anxious by the departure from Cadiz 16 June of the Spanish squadron under Admiral Camara. This consisted of the second-class battleship Pelayo, the armored cruiser Carlos V., three destroyers, three armed liners (two of which had been purchased from the Hamburg line) and four transports. The expedition was in reality as ill advised as any other act of the Spanish ministry of marine. There were but two ships of any power and one of these slow; the rest, excepting the destroyers, were powerless for offense or defense. The battle of Santiago, which left Spain's coast open to the attack of the squadron which was formed to go through the Mediterranean, settled the question of their return, which was ordered from Spain 7 July. An expenditure of $320,000 for the benefit of the canal company was the main result of the expedition. In any case the arrival of the Monterey 4 August and the Monadnock 16 August, very effective ships in smooth water, removed any anxiety on the part of the American commander. While much was to come in the Philippines, the battle of 1 May practically determined that they were lost to Spain unless she should succeed in destroying the American fleet in the Atlantic; should she do this the question of final command in Asian waters could easily wait. The loss of the Philippines could have no determining effect (valuable as the result was in prestige and in setting to rest any question of a European concert of intervention) so long as Spain could keep open her communications with Cuba, relinquishment of Spanish authority in which had been announced in the Congressional resolution of 20 April as the object of American action. In the Atlantic was her only battle squadron; so long as this was in being, so long would the war continue.

Cervera left the Cape Verdes with his four armored cruisers and three destroyers 29 April. This was known at the navy department the same day and the news at once transmitted to Sampson. The latter determined to go eastward with the main part of the battle portion of his fleet. He obtained the consent of the department, coaled his ships and 4 May left with the New York, Iowa and Indiana, the monitors Amphitrite and Terror, the cruisers Montgomery and Detroit, torpedo boat Porter, tug Wompatuck and collier Niagara. He had calculated to reach San Juan by the 8th, judging that by this date the Spanish squadron would be in that longitude and premising with his usual excellent judgment that San Juan was their objective, as was the case. Should he not find them at San Juan it was his intention to at once return to Havana, after making an effort to occupy San Juan and leaving the monitors there in occupancy, to hold it against the Spanish squadron should it appear later. Continuous breakdowns of the monitors, which had to be towed a great part of the way, and of the Indiana, so delayed the squadron that it was not off San Juan until

the early morning of 12 May. No Spanish ships were there. The fortifications were, however, assailed by the squadron in an active bombardment of three hours, in which, on the American side, one man was killed and four wounded. On the Spanish side eight were killed and 20 wounded. There is little doubt, as is known from Spanish officers present, that the place would have been yielded had the attack been a little longer continued, not through actual damage but through pressure from a population frantic with fear. Sampson, however, yielded to the arguments regarding the necessity of holding the fighting ships intact to meet the Spanish fleet, and started westward.

The day previous to that of the action at San Juan, occurred, as far as loss of life was concerned, two of the most serious fights of the war; one in connection with the cable cutting at Cienfuegos; the other at Cardenas; both were most gallant deeds. The four launches (including two steamers) of the Marblehead and Nashville, under the immediate charge of Lieutenant Winslow, were employed in the former operation, which was carried on in the early morning within a few yards of the beach under a covering fire from the ships in a rough sea and under a severe rifle fire from shore. Three hours were spent in lifting the cables, two of which were cut; a third was lifted but as it was thought to be a small cable connecting the destroyed cables with Cienfuegos and thus useless, it was left uncut, it being thought advisable not to delay for the purpose under the heavy and increasing fire. Lieutenant Cameron McR. Winslow and 12 men were wounded, two of the men mortally. At Cardenas, which was blockaded by the Machias, Wilmington, the revenue cutter Hudson and the torpedo boat Winslow, it was determined to attack the three Spanish gunboats in the port, which is extremely shallow and difficult of access to larger vessels. The Winslow, leading, had approached the town within a mile when fire was opened by the Spanish battery and gunboats. Though supported by the other ships, the Winslow armed only with three one-pounder guns could not make much return. The Spanish fire was concentrated upon her, her steering gear and one engine injured and a shell exploded in one of her boilers. She became helpless and drifted shoreward. The Hudson, the lightest of the three other vessels, gallantly went to her aid and towed her into safety, but not before the Winslow's commander, Lieutenant Bernadou, had been wounded, and a little later, Ensign Bagley and two seamen killed and two others mortally wounded by a shell which exploded on the deck. Her use for such a purpose was, of course, not justified, and the same might be said of much of the employment of these frail crafts during the war, the paucity of vessels and the necessities of the service making such misapplication unavoidable.

Sampson, standing westward with his slow squadron, received the firt news of Cervera's arrival in the Caribbean at 3.30 A.M. 15 May while off Porto Plata, San Domingo. He then learned that Cervera was on the 14th off Curacao, and that the destroyer Terror was at Martinique. The telegram announcing this directed him to proceed with all possible dispatch to Key West, whither Commodore Schley's squadron was also ordered from Hampton Roads. Cervera's slowness of movement had been a surprise to all concerned on the American side at least. The two large liners Harvard and Saint Louis had been despatched, on his departure from the Cape Verdes, to cruise on a line 73 miles north and south about 100 miles east of Martinique, until noon of 10 May. Had the orders read until 11 May, they would in all probability have sighted the Spanish squadron at sea. As it was the Harvard reached Saint Pierre, Martinique, at 9 A.M. of the 11th and the destroyer Furor, Fort de France, the capital of the island, at 5 P.M. The news reached the navy department early 12 May by telegram from Captain Cotton of the Harvard. The broken-down destroyer Terror came into Fort de France next morning and remained there until 25 May when she went to San Juan, where she will be later heard from. The presence of Sampson at San Juan changed Cervera's course. Had the American squadron been slower by two or three days in reaching San Juan, Sampson's surmise would have proved correct. He would have found and destroyed the Spanish ships there, where they were ordered to go, instead of at Santiago. Cervera's information regarding Sampson's movements caused him to shape his course from Curaçao, 290 miles away, in hope of obtaining much needed coal, and picking up the vagrant colliers Roath, Twickenham and Restormel, which had been chartered by Spain. These, however, failed him, but the Curacao authorities allowed him 500 tons for the Teresa and Vizcaya, and he was enabled to obtain fresh provisions. At 5.15 P.M. 15 May he left for Santiago de Cuba. The Saint Louis which had joined Sampson the morning of 15 May, was ordered with the armed tug Wompatuck to Santiago to cut cables, and left the squadron for that port almost at the same hour as Cervera. Captain Goodrich, commanding the expedition, succeeded 18 May in cutting one cable in over 500 fathoms of water, engaging the batteries at the same time. Having succeeded, as he supposed (mistakenly), in destroying the Santiago-Jamaica connection, he left for Guantanamo for the purpose of destroying the French cable leading from there, but an engagement of 40 minutes with the Spanish gunboat Sandoval compelled him to desist, the very vulnerable character of his own ship, wholly unfitted for fighting, rendering this necessary. At this time, 8 A.M., 19 May, Cervera was entering Santiago Harbor only 40 miles away, having taken three and a half days to traverse the 600 miles from Curaçao. Sampson reached Key West at 4 P.M. of the 18th and found Commodore Schley's squadron, which had arrived at midnight. All but the smallest vessel off Cienfuegos were ordered by the navy department to be withdrawn. The telegrams received showed that the Washington authorities were convinced by information received that the Spanish squadron was supposed to carry munitions of war essential to the defense of Havana, and that it must reach this port or one connected by rail with it, notably Cienfuegos. The flying squadron was thus, with such additional armored and other vessels as Sampson should judge suitable, to proceed to Cienfuegos, Havana being covered by the remainder of the fleet. Sampson was to have choice of command off Cienfuegos or Havana; Schley, however, to keep the flying squadron. He generously gave the opportunity to Schley, who having coaled, sailed

on the forenoon of the 19th with the Brooklyn, Massachusetts, Texas and Scorpion with orders to establish a blockade at Cienfuegos with the least possible delay. Shortly after leaving Key West he passed the Marblehead and Eagle returning from Cienfuegos, Commander McCalla of the Marblehead having withdrawn the whole force on his own responsibility. McCalla communicated the situation there by sending the Eagle to speak the Scorpion. Much was made of his failure to mention an arrangement of signals he had made with the considerable Cuban force west of the harbor in case these latter wished to communicate, but as will be seen later this was of no consequence. The Iowa, the collier Merrimac, the Castine and the torpedo boat Dupont left on the forenoon of the 20th to join Commodore Schley, thus making a force much more than able to meet the Spanish squadron. A telegram was received from the navy department at 12.30 A.M. of this day saying, "The report of the Spanish fleet at Santiago de Cuba might very well be correct; so the department strongly advises that you send immediately by the Iowa to Schley to proceed off Santiago with his whole command, leaving one small vessel off Cienfuegos . . ." The peculiar phraseology of the telegram, taken in connection with the Navy Department's insistence upon the necessity of Cervera's coming within reach of Havana, caused doubt in Sampson's mind, and he thus determined to hold the *status quo* until further information should be obtained. He thus wrote Commodore Schley to that effect, sending the despatch by the Iowa and a duplicate by the Dupont, which vessels also carried copies of a memorandum prepared by Commander McCalla regarding the Cuban forces west of Cienfuegos which showed that he had communicated with them, and mentioning a convenient landing place some 13 miles from the port. Events were, however, moving rapidly. Lieutenant Staunton, Assistant Chief of Staff, while in Key West in the forenoon of this day was told by Captain Allen, the signal officer in charge of the Key West telegraph office, that he had received the night before (19th), after 6 P.M., through an employee in the Havana office, a dispatch stating that Cervera had entered Santiago that morning with his squadron. This reached Washington as qualified by the word "probably" which no doubt caused the phraseology mentioned in the dispatch to Sampson. Captain Allen stated that his correspondent would thus send dispatches nightly after 6, and Staunton arranged to go back that evening (20th) for corroboration. This coming, a dispatch was prepared, as soon as Staunton returned with the information, to go by the Marblehead, supposed ready to leave for Cienfuegos, saying, "Spanish squadron probably at Santiago de Cuba —4 ships and 3 torpedo boat destroyers. If you are satisfied that they are not at Cienfuegos, proceed with all despatch, but cautiously, to Santiago de Cuba, and if the enemy is there, blockade him in port. . . ." As it appeared during the night that the Marblehead might be delayed, Sampson upon arrival off Havana in the afternoon (21 May) sent the Hawk as the fastest of the squadron with a copy of the despatch, and an additional memorandum, the tenor of which urged the utmost despatch as did also the verbal instructions which Lieutenant Hood of the Hawk, was ordered to communicate. Sampson moved with the available force on the north side of Cuba to Nicolas Channel, in order to have an advanced position in case Cervera should move toward Havana from the east. Hood arrived off Cienfuegos at 7.30 A.M. 23 May, delivered his dispatches and repeated the verbal instructions. He returned the same day, reaching Havana 25 May with dispatches from Schley which reached Sampson at 9.30 P.M. of the 26th by the Dolphin, whose failure to pick up the squadron earlier was a startling instance of the difficulty of finding even a large force at sea. Schley wrote that he was by no means satisfied that the Spanish squadron was not at Cienfuegos, giving a number of reasons for his belief, one of which was his having heard guns the afternoon of 21 May (when about 40 miles from Cienfuegos), which he took to be a welcome to the Spanish fleet. Lights, which turned out to be signals by the Cubans as arranged with Commander McCalla, had been seen to the westward of the harbor, but this arrangement, not having been communicated to Commodore Schley, was not acted upon, though the fact of the presence of Cuban troops in that vicinity was known from the memorandum previously mentioned. The report of Captain Dayton of 20 July when blockading Cienfuegos would seem to show that it was not necessary to apply to the Cubans for knowledge regarding ships in the harbor. Dayton says (p. 219 Appendix to Report of Chief of Bureau of Navigation 1898) "During the afternoon I made as close an inspection [of Cienfuegos Harbor] as practicable. From aloft could detect in the inner harbor four large steamers flying Spanish colors, one with four masts and one smoke stack, one with three masts and one smoke stack, and two with two masts and one smoke stack; also two fair-sized gunboats, the larger being apparently of the Esmeralda class. . . . The four-masted steamer was surrounded by lighters and appeared to be discharging cargo."

The arrival of Commander McCalla, however (with the Marblehead, 24 May), who at once found the Cubans at the point which had been designated in his memorandum settled the fact that Cervera was not at Cienfuegos. Commodore Schley thus left that evening with his squadron, making, however, such slow progress that he was not off Santiago, 315 miles from Cienfuegos, until the afternoon of 26 May. The Yale, Saint Paul and Minneapolis were at the moment off Santiago by orders of the Navy Department to watch the port, and on the morning of 25 May the Saint Paul had captured the British collier Restormel with 2,400 tons of coal which had already touched at Porto Rico and Curaçao from which latter place she had been ordered to Santiago. The Harvard which had also been there had gone to Saint Nicolas Mole to send a dispatch received by the Scorpion 24 May from Commodore Schley. The three other ships, sighting the smoke of a number of ships to the south, had steamed in that direction, thus leaving the port without any observing ship, a fact which as will appear later might have had most serious consequences. It was found that Commodore Schley had determined to return to Key West and at 7.45 P.M., signal being made to that effect, the squadron headed westward with the collier Merrimac in tow of the Yale. The frequent breaking of the towline caused little prog-

ress to be made. The Harvard on the morning of 27 May reached the squadron and delivered a telegram received from the Navy Department at Saint Nicolas Mole the preceding morning (26 May), the more important part of which was that directing him to proceed at once and inform Schley and also the senior officer present off Santiago de Cuba as follows: "All Department's information indicates the Spanish division is still at Santiago de Cuba. The Department looks to you to ascertain fact and that the enemy, if therein, does not leave without a decisive action. . . ." This was answered (sending the Harvard to Kingston for this purpose and for coal) in a telegram, the main parts of which are as follows. ". . . . Merrimac's engine is disabled and she is helpless; am obliged to have her towed to Key West. Have been absolutely unable to coal the Texas, Marblehead, Vixen and Brooklyn from collier owing to very rough seas and boisterous weather since leaving Key West. Brooklyn is the only one in squadron having more than sufficient coal to reach Key West. Impossible to remain off Santiago in present state of coal account of squadron. . . . It is to be regretted that the Department's orders cannot be obeyed, earnestly as we have all striven to that end. I am forced to return to Key West via Yucatan passage for coal. Can ascertain nothing certain concerning enemy. . . ." This was a very unhappy telegram in view of the facts that the Iowa, Massachusetts, Castine and Dupont had coaled from the collier at various times and that the Texas and Marblehead took coal the evening of the day the despatch was sent; that while it was but 790 miles to Key West, the Massachusetts had sufficient coal to steam at 10 knots, 2,371 miles; the Iowa, 2,028; the Texas, 1,459. The Brooklyn had enough to have blockaded 32 days, the Massachusetts, 24; the Iowa, 18; the Texas, 14, and the Marblehead about 6 days and still have enough to go to Gonaives Bay in Hayti (Testimony Schley Court of Inquiry, p. 535). There was, moreover, the splendid and commodious harbor of Guantanamo but 40 miles east of Santiago, to be had, so to speak, for the asking. Had the squadron gone to Key West, it would still have had to coal at an anchorage in the open sea. Nor was any real endeavor made to get information as to the presence of the Spanish squadron. Most fortunately the next day, 28 May, Commodore Schley now 38 miles west of Santiago, decided to return and go off the port. He arrived there the same evening and the question of the presence of the Spanish squadron was fixed by discovering the Colon moored near the harbor entrance; and another man-of-war and two destroyers near her. Cervera had been twice on the point of leaving Santiago for San Juan, Porto Rico, and steam was actually got up on the evening of 26 May, and every preparation made to leave, when his heart failed him at the report that the swell was sufficient to cause danger of the Colon's striking a rock off Point Morillo on which there was but 2½ feet of water more than the Colon drew. With the American squadron so far (20 miles at 8 P.M.) to the south and with the intended departure so near nightfall, it is very probable the Spanish squadron would have got away unnoticed. There is no need to dwell upon the sensation such an escape would have made.

Schley's telegram of 27 May produced consternation at Washington. Sampson on the north side of Cuba had occupied Nicolas Channel 25 May. The force in the beginning was a very meagre one, the New York and Indiana being the only armored ships; with these were the gunboats, Newport, Vicksburg, Mayflower, Machias, and the torpedo boats Rodgers and Foote. If the Spanish squadron should be met it was expected that the gunboats should be sacrificed in the general attack. In the afternoon of the same day, however, the fast and excellently armed cruiser New Orleans joined, and by the 25th were added the Montgomery (with the broad pennant of Commodore Watson), the Cincinnati, Detroit, Miantonomoh, Puritan, Terror, Amphitrite, Wilmington, Wasp and Vesuvius; a powerful force if the Spanish squadron would only wait an attack, but amounting to little if it should use its speed to escape. This heterogeneous collection of ships was fitly called by the men the "Bargain Counter" squadron. The despatches brought by the Dolphin in the night of 26 May, announcing that Commodore Schley had not moved from Cienfuegos, caused the Wasp to be despatched to him with an order to proceed "with all possible dispatch to Santiago to blockade that port. If on arrival there you receive positive information of the Spanish ships having left, you will follow them in pursuit." This, of course, was not delivered, the Wasp having found that Commodore Schley had already gone. Sampson supposed this might be the case, as appears in his telegram of 27 May to Washington, and his supposition was confirmed by a telegram sent by the torpedo boat Dupont 24 May by Commodore Schley to Key West for transmission to Washington, in which he mentioned that he would "move eastward tomorrow" (25th), though in fact he left that night. The mention of this delay, however, decided Sampson to go himself to Santiago. The New Orleans was ordered there with the collier Stirling, and her commander, Captain Folger, was ordered to communicate with Schley "and direct him to remain on the blockade of Santiago at all hazards, assuming that the Spanish vessels are in that port." He also carried directions to use the Merrimac to block the harbor entrance, a suggestion for doing so also coming from the Navy Department. Though somewhat criticised, this was wise from the point of view at the time. The telegram of the secretary of the navy of 5 May directed Sampson not to so risk his ships against fortifications "as to prevent from soon afterward successfully fighting the Spanish fleet composed of the Pelayo, Colon, Teresa and four torpedo boat destroyers if they should appear on this side." Spanish reinforcements were thus regarded possible; there were two destroyers in Santiago and the danger to ships on blockade of being torpedoed would be constant; to hermetically seal a powerful squadron in the port, the entrance channel to which was less in breadth than the length of a ship of moderate size, thus leaving our own force free for other operations, was sound policy and so held by every one consulted.

Sampson arrived at Key West at 2 A.M. 28 May and found the Oregon, which had completed her brilliant voyage of 16,000 miles, 26 May. She was reported ready for any service and left during the day for the squadron in Nicolas

Channel. At 8 Sampson received the telegram announcing the intention to send 10,000 troops to Santiago and that he was expected to convoy the transports, going in person; but about midnight the Department's telegram arrived, reporting Schley's intention, expressed in his telegram of the 27th, to return to Key West, and asking Sampson how soon he could reach Santiago with the New York, Oregon, Indiana and some lighter vessels, and how long he could blockade there, sending his ships singly to a coaling point. Sampson answered this at 3 A.M. (29th), that he could reach Santiago in three days and could blockade indefinitely; that he thought he could occupy Guantanamo; and that he "would like to start at once with the New York and Oregon, arriving in two days. Do not quite understand as to the necessity of awaiting the arrival of Schley but would propose meeting and turning back the principal part of the force under his command if he has left. Try to hold him by telegraph. Watson will be in charge of everything afloat. Does the Department approve proposed action?" About noon, no reply having been received, Sampson sent another telegram urging immediate reply. A little later came one from Commodore Schley direct and also the substance of the same repeated from the Navy Department, showing that he had arrived off Santiago and that he would remain "until coal supply of larger vessels has given out . . . "; and also announcing the capture of the collier Restormel by the Saint Paul. Sampson replied to this "Congratulate you on success. Maintain close blockade at all hazards, especially at night; very little to fear from torpedo boat destroyers. Coal in open sea whenever conditions permit. Send a ship to Guantanamo with view to occupying it as base, coaling one heavy ship at a time. Appraise captured coal, use if desired and afterward send ship in as prize."

In the afternoon the desired permission to go to Santiago was received, and at 11 P.M. the New York, having finished coaling, left for Nicolas Channel, reaching the squadron at 7 A.M. Commodore Watson was conferred with and at 9.07, signal being made to the Oregon, Mayflower and torpedo boat Porter to form column on the New York, Sampson stood eastward at 13 knots. The squadron arrived off Santiago at 6 A.M. 1 June (in less than two days) having met in the Bahama Channel the Yale and Saint Paul. From Captain Sigsbee of the latter, the admiral received copies of several telegrams from Commodore Schley taken by the Saint Paul to Nicolas Mole, which showed that the enemy's ships had been seen in port, and that the situation would be held. As the squadron arrived, the Colon and one of the Vizcaya class were seen about seven eighths of a mile within the entrance, but they moved out of sight almost at once, which, in the case of the Colon, could be done without unmooring, by veering the hawsers attached to the shore and heaving in on her chain, the distance to go to take her out of view being very slight (her log mentions leaving her moorings at this point at 10.35 A.M.). The day previous (21 May) Commodore Schley had gone aboard the Massachusetts and with the Iowa and New Orleans had fired upon the Colon and the batteries at the entrance. The ships passed the entrance twice at a speed of 10 knots and the ranges, as stated in the Iowa's log, at first 8,500 yards, increasing to 11,000. The total time of firing stated by the Massachusetts was 7 minutes 35 seconds. One shell, reported in the Colon's log as exploding near the stern, did some slight damage, but a battle between ships at the ranges reported in the log of the Iowa, 8,500 to 11,000 yards (from nearly 5 to over 6 miles), or even at 7,000 (4 miles), the range first proposed, and lasting the time reported by the Massachusetts, could not be effective.

Sampson at once made preparations for sinking the Merrimac, Naval Constructor Hobson being put in charge, as he had been previously directed, as an expert, to study the question of the best steps to be taken to sink her quickly. Hobson was finally allowed to take the ship in. Many were as eager to go as he, the officers and men volunteering by the hundreds, but Sampson was moved to let it fall to Hobson from a sense of fairness, in that he had done the whole work of preparation. It was breaking day when the ship finally started and it became so light that she was recalled and sent in the night following; but her steering gear being shot away, she drifted, before sinking, too far up the channel to block it in any degree. Had her bow taken the east side of the channel at the point proposed, her stern would have swung with the tide (running flood) in such a way that the channel would have been closed almost as a caisson closes a dry dock. It was fortunate, of course, in the light of events that it was otherwise. Hobson in his graphic and most excellent account says that he would more certainly have succeeded had he not been recalled on his first start. The writer is now inclined to agree with him and rather the more as an amend for his share in causing his recall. But the fame of an heroic act is Hobson's all the same, and the failure made the third of July victory possible.

Sampson on arrival had found the Flying Squadron moving in column east and west in face of the port. He changed this, placing the ships with their heads toward the harbor entrance on a six-mile radius, which made a semicircle of about 9 miles. (This was later reduced to 4 during the day and 3 at night, with much less for certain ships.) An order of battle was issued 2 June dividing the fleet into two squadrons, one (to the east) under the personal command of the commander-in-chief, the other (to the west) under Commodore Schley. This order enjoined: "If the enemy tries to escape, the ships must close and engage as soon as possible and endeavor to sink his vessels or force them to run ashore in the channel. It is not considered that the shore batteries are of sufficient power to do any material injury to battleships." On 6 June the batteries were actively bombarded. The next day Guantanamo Bay was occupied by the Marblehead and Yankee and thenceforward was Sampson's base; the fort at the head of the deep water bay was destroyed 15 June by the Texas, Marblehead, and Suwanee, the two former coming in contact each with a heavy gun cotton mine, but, in the pious language of Captain Philip, in his report, "owing to Divine care neither of them exploded." While every combatant is ready to suppose Providence on his side, some credit ought to be given to the barnacles which had grown so actively that the mine machinery could not operate. On the 10th, the marine battalion arrived in the Panther and at once

went into camp, where from 11 May to the 14th it underwent a severe fire from the enemy, occupying a commanding position, in which some lives were lost. On the 14th, however, a force of two companies of marines and 50 Cubans, under Captain Elliott, attacked some 500 of the Spanish and destroyed their only water supply from which time the bay and vicinity remained undisturbed, though there was a force of over 7,000 Spanish at and near Guantanamo town, 12 miles from the bay head.

On 7 June a memorandum for night duty was issued ordering three picket launches to be placed 1 mile from the Morro, the Vixen, Suwanee and Dolphin on a 2-mile radius from the Morro, the larger ships to come within a 4-mile radius. The memorandum continued: "I again call attention to the absolute necessity of a close blockade of this port, especially at night and in bad weather. In the daytime, if clear, the distance shall not be greater than 6 miles; at night, or in thick weather, not more than 4 miles. The end to be attained justifies the risk of torpedo attack, and that risk must be taken. The escape of the Spanish vessels at this juncture would be a serious blow to our prestige and to a speedy end of the war. . . ." Memorandum No. 14, issued the next day (8 June), had a most important bearing upon the final successful result. It directed the battleships to take turns of 2 hours each, beginning at dark, in illuminating the harbor entrance with a search light. Later a second battleship was kept close to the illuminating ship so that the former could do any firing necessary without disturbing the illumination. The ship using the search light was kept not beyond two miles from the Morro and was frequently nearer. The effect was a complete lighting up of the harbor entrance, making it impossible for the smallest craft to appear without being seen. It was the main element, as Admiral Cervera mentions, in preventing any attempt to leave at night. Memorandum 20 of 15 June directed that the distance of 4 miles from the entrance during daytime should under no circumstances, even when coaling, be exceeded. The next day the batteries were again bombarded. It was clear to the admiral's mind that in themselves they were not to be taken as a serious obstruction to the fleet. The Vesuvius had arrived 13 June and from this time forward for many nights shook the vicinity with the explosions of her shells. While it cannot be said that they produced much actual damage, as there was so little to sustain damage, the batteries being but small objects for such practice, they certainly had a very marked moral effect upon those in the vicinity of their fall, the Pluton, by Spanish accounts, being so violently lifted once that every one was thrown off his feet. The New Orleans and Texas had each by order of the Admiral engaged singly the batteries and it was clear that they alone were not an obstruction to the fleet; but the mines had to be reckoned with and Sampson urged the sending of the army, telegraphing that with 10,000 men the city and squadron could be captured in 48 hours. His only view of the case, and the correct one, was to land in the vicinity of the entrance, capture the batteries and occupy the adjacent positions, so that the fleet could at leisure lift or destroy the mines and enter the harbor.

When the war came the regular army of the United States had but 2,116 officers and 25,706 enlisted men. There were 25 regiments of infantry, 10 of cavalry and 5 of artillery. The bill approved 22 April declared all able-bodied male citizens from 18 to 45 liable to military duty; that the President might call upon each State and Territory for troops in proportion to its population; that the regimental and company officers should be named by the governors of the States, the general and staff officers by the President. On 23 April a call was made for 25,000 men. On 26 April additional enlistments in the regular army were authorized temporarily to a total of 62,597 men. In May the enrollments amounted to 124,776 men. A second call 25 May for 75,000 caused the volunteer army to reach in August its highest number, 216,256. Immediate steps were taken by the War Department towards concentration, chiefly at Chickamauga, Tenn., Camp Alger, Va., and at Tampa, Fla.; the last being selected as the point of departure of the invading force for Cuba, though many, including its General-in-Chief advocated strongly making no move to invade the island until October on account of its supposed deadly summer climate. Historical precedents were brought to bear showing the fearful losses of expeditions of earlier centuries; with as much reason might one have deprecated living in London because it once suffered from the plague. It was, as we came to know from the experience of the marines at Guantanamo, a question of care; but this care could not be given without experience on the part of officers and men, and the officers of the regular force were too few to count as against the rawness and ignorance of the vastly greater number of volunteer officers who had never known anything of the care of troops. The zeal and spirit of the army of volunteers, composed, as much of it was, of the best blood and intelligence of the country, were far from being an offset to their inexperience in the field. The army corps numbered eight, but the sixth was never organized. The fifth, under Major-General Shafter, at Tampa, numbering about 15,000 men; and a part of the eighth, Major-General Merritt (some 11,000 out of a total of 16,000 at San Francisco) were those actively employed before hostilities ceased. Shafter received orders 9 May "to move his command under protection of the navy and seize and hold Mariel on the north coast of Cuba, where territory is ample to land and deploy army," troops to be fully equipped, abundance of ammunition and food for men and animals for 60 days. Such orders indeed point a moral in the circumstances, and in themselves stand an all sufficient reason for the general staff now in being. An expedition under Colonel R. H. Hall had landed some arms and supplies for the insurgents and this was followed 11 May with one under Captain Dorst with 100 men of the 1st infantry who attempted a landing 40 miles west of Havana but were repulsed. The failure was due partially to newspaper publicity, partially to the use of the Gussie, a very conspicuous and rather ridiculous looking side wheel steamer, as well known along the Cuban shore as Morro Castle. Sampson received a telegram 28 May announcing the intention to send 10,000 troops to Santiago which he was expected to convoy in person, and the War Department had at once begun to collect transports at Tampa. General

Shafter telegraphed 1 June that he was progressing rapidly with loading transports and that he expected to be ready to start Saturday morning (4 June). The gunboats Annapolis, Helena, Castine, and Hornet were at Tampa; when all should be ready the fleet to rendezvous to westward of Dry Tortugas, where it was to be met by the battleship Indiana, the Detroit, Bancroft, Manning, Wasp, armed tugs Wompatuck and Osceola; the whole naval force to be under the command of the senior officer, Captain Taylor of the Indiana. On 9 June, however, Sampson received a despatch from Key West via Nicolas Mole that the armed yacht Eagle had on the night of 7 June, when 15 miles north one-half east of Bahia de Cadiz light, sighted to the north northwest an armored ship, a protected cruiser, and two destroyers in fleet formation, and that the Eagle had scouted abreast "until character of Spanish vessels was ascertained. . . One deep sea torpedo vessel chased Eagle for a short time. . . . Resolute confirms it." The next day Sampson received a telegram from the Navy Department that the army expedition was stopped temporarily on account of the report Eagle and Resolute; that the convoy was distributed to scour the straits and re-enforce the blockade, and he was directed to send two of his fastest armored ships to search through Nicolas Channel, and then reenforce the convoy. The telegram asked "Are you sure all four Spanish armored cruisers are at Santiago?" The only action taken by Sampson was to telegraph that he had no confidence in the report and that he considered it very unwise to suspend operations on this account, "but even if it is found correct there is sufficient force to furnish convoy. Armored vessel was probably Talbot which was sighted Thursday at 9 A.M. by the Scorpion standing east; am confident no large ship escaped from here. . . ." His view was correct, the armored ship as is now known was the English cruiser Talbot which left Havana that evening and was sighted by the Eagle at the same time with the Armeria and Supply under convoy of the Scorpion. Sampson sent for the log of the Scorpion, determined her position at the time and so telegraphed the Navy Department. To set the matter completely at rest Lieutenant Blue, who volunteered for the service, was landed 11 June at Aserradero, 15 miles west of Santiago, whence he went inland with guides furnished by General Rabi to a hill overlooking Santiago Bay. He reported aboard his ship, the Suwanee, again the morning of the 13th, after a journey of 70 miles (the same officer made a similar journey 25 June to locate each ship). Sampson's telegram and Blue's report fixed the question of starting the army expedition and on the 14th the force, 819 officers and 15,058 men, was under way. There is no need to dwell upon the shortcomings of transport or organization for the movement of so large a body of men over sea; such difficulties are the natural outcome of the want of organization which existed for so many years. Almost the worst feature of the whole was the clothing worn; the men landed in the tropics in that in which they came from our coldest climates. The expedition arrived off Santiago the morning of 20 June, stopping by arrangement 20 miles south of the port. Captain Chadwick, Chief of Staff, was sent by Admiral Sampson in the Gloucester to see General Shafter, and took with him a chart of the harbor to explain to Shafter Sampson's views with regard to his proposed assault and capture of the harbor entrance in order that the fleet might enter. General Shafter at the time entirely agreed with this view, as indeed his orders of 31 May from the War Department suggested. His ship, the Segurança, then steamed up to the squadron; Sampson and his assistant Chief of Staff, Staunton, came aboard and a visit was paid to Garcia's camp near Aserradero. General Shafter apparently dropped the scheme of assaulting the batteries and determined to land at Daiquiri, 17 miles east of Santiago, used as a port for the shipment of ore by an American mining company. There were, however, no conveniences for landing, beyond a very small wooden wharf; the place was a mere indentation in the coast line giving some protection from the usual southeast swell. Captain Goodrich of the Saint Louis was put in charge of the landing beginning 22 June, a task which was executed with great success. In all 29 boats, of which 12 were steam launches, were furnished from the fleet besides the 23 of the Saint Louis. A feint was made by the fleet and 10 of the transports of disembarking at Cabañas Bay, two miles west of the harbor. General Rabi with 500 Cubans was also to make a demonstration near by. The New Orleans, Detroit, Castine and Wasp were stationed off Daiquiri, the Helena, Bancroft and Hornet at Siboney (7 miles nearer Santiago than Daiquiri), the Gloucester and Eagle at Aguadores (3 miles east of the port) and the Texas, Vixen and Scorpion at Cabañas; the extent of coast line covered was 32 miles. Great difficulty was experienced through the wretched conduct of many of the transport captains who were under no proper control and wandered over the sea at will. Hours were spent in finding some of them, and when found they would insist upon lying miles from a shore which they could have approached with safety within a ship's length. By sunset 6,000 men were ashore with the loss of two drowned by the capsizing of a boat. The immediate desertion by the Spaniards, under the fire of the fleet, of all the points about Daiquiri and Siboney, but 10 miles from Santiago, caused the transfer to the latter point of landing operations, and this was thenceforward the army base. Wheeler, the senior officer ashore (Shafter remaining aboard until the 29th), ordered Young to make a forward movement on the 23d, which brought about the skirmish of Las Guasimas, in which the 1st and 10th cavalry and the Rough Riders, all of course unmounted, were engaged. The American loss out of the 964 in the fight was 16 killed and 52 wounded. The Spaniards retreated leaving 11 dead. On 24 June the last of the troops had been landed and two days later the field batteries were ashore. Shafter sent a telegram to the War Department gracefully acknowledging the services of the navy: "Without them I could not have landed in 10 days and perhaps not at all, as I believe I should have lost many boats in the surf." More difficult, however, was the question of getting supplies ashore, as the fleet's boats with their crews had to return to their ships; and the army had a hand to mouth existence for days which must have been a serious element, through ill nourishment, in the development of

the sickness later. On the 25th and 26th Garcia's force of 2,978 was transported from Aserradero; on the 27th the 33d and part of the 34th Michigan arrived under Brigadier-General Duffield from Camp Alger and went into camp at Siboney. By 30 June the American force was in face of the Spanish positions to the east and northeast of Santiago and in the afternoon a council was called in which plans were made for the battle of next day, 1 July; Lawton's division to assault El Caney at daybreak, Wheeler's and Kent's the lines to the east of and near Santiago. It is impossible in the space to deal with the details of these actions, which reflected the greatest credit upon both victor and vanquished. The American force was greatly superior in numbers, the force under Generals Lawton, Chaffee, Ludlow, and Colonel Miles (commanding a brigade) attacking El Caney, numbering 6,654, against about 500 Spanish, who, occupying a strong defensive position, maintained themselves most heroically, losing 300 killed and wounded, and 150 captured. Among the killed were General Vara del Rey and his two sons. The American losses at this point were 88 killed and 355 wounded. The attack upon the main Spanish lines east of and near the city, along the crest of San Juan hill was made by the dismounted cavalry division under General Wheeler and the 1st infantry division under General Kent, the whole force numbering 8,336 men. Lieutenant Miley, of Shafter's staff, gives the numbers of the Spanish as 750 in the most advanced position on San Juan Hill and 3,500 immediately in the rear. There were about 1,000 men ashore from the Spanish squadron under Cervera's Chief of Staff, Captain Bustamente, who was mortally wounded. San Juan Hill was occupied by the Americans after a most courageous and bloody struggle with the loss of 144 killed and 951 wounded. The casualties of the day were thus over 10 per cent of the force engaged. It may confidently be said that few armies would have won success under the immense disadvantages to which the Americans were subjected. Suddenly transported to a tropical climate, with clothing of a character in itself to madden a man into illness, with the scantiest of rations for days, subjected daily to torrential rains, fighting through the thickest of jungle, opposed by an entrenched foe with smokeless powder, it required to win men such as composed this force, the finest in the writer's opinion, through its practical experience and training, ever put into the field. Nor must the disabilities of the Spanish be overlooked. They were ill fed, had long undergone the depressing effects of the tropics, and were in no condition to meet a determined foe. They showed the obstinate courage always shown by their race when on the defensive, and sustained to the full its honor.

Admiral Sampson, at the request of General Shafter, had supported, on the 1st, a demonstration at Aguadores by a force commanded by General Duffield; the few Spanish seen having disappeared, the New York and Oregon fired a number of 8-inch shell over the hills in the direction of Santiago and the ships in the bay. The evening of this day Colonel Escario with 3,500 men entered Santiago from Manzanillo, a reinforcement which in the existing destitution but added to the difficulties of the Spanish. Sampson at Shafter's request bombarded again the batteries at the entrance 2 July. Shortly after, Shafter sent a message urging Sampson to force an entrance, to which reply was made that this was impossible until entrance was cleared of mines; a work of some time after the forts should be taken. Shafter stated it was impossible to say when he could take these and if as difficult as what he had been pitted against, it would require time and great loss of life. "I am at a loss to see why the navy cannot work under a destructive fire as well as the army. My loss yesterday was over 500 men. By all means keep up fire on everything in sight until demolished. I expect, however, in time and with sufficient men, to capture the forts along the bay." Sampson at once replied that the forts could not prevent his entrance but that it was a question of mines, to attempt to go over which would certainly result in the sinking of one or more ships, thus preventing further progress by the fleet. He said: "It was my hope that an attack on your part on the shore batteries from the rear would leave us at liberty to drag the channel for torpedoes. If it is your earnest desire that we should force our entrance I will at once prepare to undertake it. I think, however, our position and yours would be made more difficult if, as is possible, we fail in the attempt." The Resolute, carrying 40 mines, was at once ordered from Guantanamo and Sampson purposed as soon as the arrangements could be made for countermining, to bring up the battalion of marines, with which and with those of the squadron, about 1,000 in all, he proposed to assault the western side of the entrance, the army to take the eastern. His Chief of Staff went to Siboney to arrange for a consultation respecting this combined action between the two commanders-in-chief. This consultation was set for the next morning, Sunday, 3 July. During the night there were several large fires on the distant hill tops, evidently the burning of block houses. The Massachusetts, as soon as her searchlight duty had ended at 4 A.M. (3 July), left for Guantanamo for coal. The ships present were in order from east, the Gloucester, Indiana, New York, Oregon, Iowa, Texas, Brooklyn, Vixen; the armed yacht Hist; the torpedo boat Ericsson and the transport Resolute carrying the mines, which had been brought the day previous from Guantanamo. At 8.50 A.M. the New York had begun to turn towards Siboney, but seven miles from her position, to carry Sampson to the meeting with General Shafter. She had been fairly on her course from 30 to 35 minutes when, attracted by the sound of a gun from the Socapa battery, the Spanish ships were reported leaving the harbor. The flagship, then seven and a half miles east of the harbor entrance, at once turned, hoisting the signal "Close in toward harbor entrance and attack vessels." On account of the position of the sun, behind the signal, it is not probable that this signal was read by either the Gloucester or the Indiana, both of which were nearer to the New York (the former less than half the distance at the time of the latter's turning) than to the Brooklyn. The Teresa and Colon, the one flying the Admiral's flag, the other unmistakable because of her peculiar features, were named by the signal quartermaster as they came out. After the fourth (the Oquendo) there was a very appreciable interval before the destroyers

appeared, the last emerging about 10 o'clock. Several of the ships hoisted almost at the same time the signal "Enemy's ships escaping" though the Iowa seems to have been the first, as from her position she had the best view into the harbor. All the ships at once closed in and began firing upon the escaping Spaniards who stood west close in shore. The American ships naturally converged to the north, taking up a more westerly course as the Spanish ships moved westerly. The Brooklyn, however, made at this juncture a turn with the port helm, endangering the Texas, which backed her engines to avoid collision. One after the other the Teresa and Oquendo were seen to turn inshore afire and they were beached, the Teresa 5½, the Oquendo 6 miles west of the harbor entrance. The destroyers Pluton and Furor were fired upon by the Indiana and Iowa, but were destroyed in the small bight 4 miles west of Santiago largely by the fire of the Gloucester which engaged them with the utmost intrepidity. They were also fired at by the New York. The Vizcaya and Colon were still steaming west but the former hauled down her colors and turned in to the beach at Aserradero, 15 miles from the harbor, crossing the bows of the New York within a few hundred yards. The flagship signalled the Indiana to return off the port. The Iowa remained near the Vizcaya with the Ericsson and Hist to rescue the Vizcaya's crew. The Gloucester rendered the same service to the Teresa and Oquendo, assisted later by the Indiana, Iowa and Hist, a duty which was rendered under great difficulties and danger. The chase of the Colon continued, the ships in pursuit the Brooklyn, Oregon, Vixen, Texas and New York (taken in order from seaward). The Oregon began firing her 13 inch guns at 10,000 yards range and the shot went over; her 8 inch guns were also tried but fell short as did the Brooklyn's. The Oregon reduced the range to 9,500, to 8,500, then 9,000, when at 1.20 the Colon hauled down her colors, turned inshore and ran her bows on the steep beach where empties the little river Turquino under the mountain of the same name, the highest in Cuba (8,400 feet). The nearest ships had still over five miles to run to reach this point and on arriving near, Captain Cook of the Brooklyn boarded the Colon and received her surrender. He stopped on his return and reported aboard the New York which was the third ship to arrive, having passed the Texas and Vixen.

Note:— The log of the Texas is inaccurate in stating that the New York and Vixen came up about 3.00; the writer has a photograph taken from the Texas showing the New York passing the Vixen and from a direction which shows the New York must have passed the Texas. The time is marked by the signal flying from the New York which the Brooklyn's log gives as received at 1.50.

The Oregon was ordered to take charge of the Colon. The ship, however, was clearly sinking. All her sea valves had been opened and though every effort was made to save her, and when the rising tide had floated her during the evening she was pushed hard ashore by the New York, she turned over on her side as she sunk and there remains. The Resolute, ordered by the Commander-in-Chief to report at Guantanamo the exit of the Spanish squadron, had met off Daiquiri an Austrian man-of-war whose flag is so similar to that of Spain that a warning memorandum had been issued in expectancy of a visit from the Maria Theresa, which this ship turned out to be. The Resolute taking the ship for Spanish turned westward warned the Harvard at Siboney, which also sighting the stranger stood west with the same news. The Resolute arrived at Rio Tarquino with the news, the Brooklyn was ordered to investigate the report, and proceeding to the eastward met the Austrian vessel and after some delay ascertained her character. The distance from the Santiago entrance to the point where the Colon was beached is 52 nautical miles. Taking the ships successively from the east to west positions, the New York was 59½ miles, the Oregon 53, the Texas 50¾, the Brooklyn 49½ miles from this point when the Spanish ships came out. Allowing 5 minutes to get headway and 2 miles for changes of direction of the Brooklyn, the speeds of the Oregon and Brooklyn to 1.20 P.M., when the Colon surrendered and these ships as established by the Oregon's gun ranges were 4 miles east of the Colon's turning in point, were for the Oregon 13.37 knots and for the Brooklyn 12.06; for the New York to the time of stopping at 2 P.M. at the point of beaching (allowing 5 minutes to turn) 13.73; the Texas to the same point, and allowing 1 mile lost in backing and her time of arrival as 2.05, 11.72 knots.

Admiral Cervera and a large number of his officers and men were received on board the Iowa, but all these as well as those on board the Resolute from the Colon were transferred to the Harvard and Saint Louis later; 1,615 men were taken to Portsmouth, New Hampshire, and interned; the larger number of officers were cared for at Annapolis. The total Spanish loss was 353 killed or drowned and 151 wounded. The American loss was one man killed aboard the Brooklyn. There was the same disparity of damage as at Manila, in no wise to be accounted for by disparity of force. The Spanish were greatly outmatched in heavy guns, having but 6 11-inch against the 14 12- and 13-inch and 38 8-inch of the Americans; but in rapid fire of lesser calibre, which should have done some damage against unarmored parts, they were practically equal, having 10 6-inch, 30 5-inch and 6 4.7-inch against the American 14 6-inch, 12 5-inch, and 18 4-inch.

The next evening, 4 July, at midnight the searchlights showed a large ship in the entrance to Santiago harbor. This, as known later, was the cruiser Reina Mercedes, sent down to block the channel. She was sunk by the gunfire of the Texas and Massachusetts and later raised and sent to the United States. The destruction of this squadron was virtually the end of the war.

The firing on shore had been renewed the morning of the 3d, but at 8.30 A.M. General Shafter sent a letter to the Spanish commander saying that unless he should surrender he would be obliged to shell the city and allowing until 10 next morning for women and children to leave. At 6.30 P.M. a letter was received declining surrender, but Shafter on request of the various consuls delayed further action until the 5th. On 6 July Sampson's Chief of Staff visited General Shafter with reference to further action, and the result of the conference was that a second letter was sent the Spanish commander giving the facts of the destruction of the Spanish ships and the ability of the squadron to shell

his position with 8- and 13-inch shell; it urged surrender suggesting a reference of the situation to his government, in the meantime the cessation of hostilities to continue. On 8 July the Spanish general offered to leave Santiago with arms and baggage provided he should not be molested before reaching Holguin. This was referred to Washington and was declined. At 4 P.M. 10 July the truce was ended, and firing began on both sides, the heavy shells of the navy during this and the next day falling in the town and destroying 57 houses. At 2 P.M. the 11th the firing ceased and was not renewed. General Toral was informed of the heavy American reinforcements, and surrender was again demanded, the government of the United States offering to transport the entire Spanish command to Spain. A surrender was agreed upon 14 July, this to include not only the troops in Santiago but all those of the Department, a total of about 24,000. The city was delivered to the Americans 17 July. The result was fortunate for the American force in view of the sickness which had rapidly developed through the constant rains, bad shelter and insufficient food in the earlier days of the investment. The situation became such that the general officers united in advising the removal of the army from Cuba. On the other hand the marines at Guantanamo, under the excellent conditions of shelter and food and water supply which they had been able to keep up, were remarkably healthy, the sick list not rising above that which was usual at home ports; the same can be said of the fleet, which kept its normal health. General Miles had arrived off Santiago 11 July in the Yale with 1,500 troops. As soon as the surrender of Santiago was determined an expedition to Porto Rico under his command was organized, which sailed 21 July with 2,000 additional men. The battleship Massachusetts and 13 other naval vessels were detailed for service with the expedition.

There were in Porto Rico 8,223 regular Spanish troops and 9,107 volunteers. The destroyer Terror and small cruiser Isabel II. were at San Juan, the former badly injured in an action with the Saint Paul 22 June. She had been struck by two 5-inch shells, had 3 men killed and her machinery so damaged that she returned to port with difficulty. The Gloucester seized Port Guanica 25 July and Ponce surrendered to the Dixie 28 July, in each case without appreciable resistance. Both places were occupied by American troops. Reinforcements were rapidly arriving, there being available by the end of July a force of 9,461 officers and men (rising by the end of August to 16,973). Advance was made from Guanica, Ponce and Arroyo. Several skirmishes ensued, in which 3 enlisted men were killed, and 4 officers and 36 men wounded. The cessation of hostilities 12 August prevented the more serious work which would probably have been met in carrying the Spanish entrenched positions in the advance to San Juan.

General Merritt in command of the expeditionary force to the Philippines had arrived 25 July. Accompanying him was a force of 4,847 officers and men, part of which did not arrive until 21 July. He had been preceded by the expedition under General Anderson with a force of 2,501, arriving at Cavite 30 June, and by that under General F. V. Greene of 3,586, July 17.

The situation at the time of General Merritt's arrival was quiescent, but was seriously complicated by the presence of a Filipino army of probably 12,000 well-armed men under Aguinaldo, who had proclaimed an independent government. The investment, however, proceeded without reference to this force and under the strain of considerable firing from the Spanish lines at night. A joint demand on the part of the military and naval commanders-in-chief for surrender was made 7 August. The Governor General declined but offered to refer to his government. This was declined by the American commanders and the city was taken by assault, with but a show of resistance, 13 August. The total army casualties during the investment and assault were 17 enlisted men killed, and 10 officers and 96 men wounded. Commodore Watson, relieved in the second command of the blockade on the north coast of Cuba by Commodore Howell, had been assigned 7 July to the command of the squadron to join Admiral Dewey in the Philippines. This was to proceed, until their separation in the eastern part of the Mediterranean, in company with the whole available armored force under Admiral Sampson. The protocol suspending hostilities, signed 12 August, of course ended the expedition and Sampson with the battleships and armored cruisers of his fleet arrived at New York 20 August, meeting an improvised reception which in spontaneity, magnitude and picturesqueness, combined as they were with the sentiment attaching to a victorious fleet, has never been equaled in our country. The total losses had been in the army 279 killed, 1,465 wounded; in the navy 16 killed, 68 wounded.

The Spanish war, short and comparatively bloodless as it was, lifted the United States to a new plane. They became at once one of the dominant factors in world politics. Whatever the divergence of views, ethical or financial, in regard to the territorial acquisitions, there can be none as to the vastness of the change, considered politically. The primary cause of the war, the freeing of Cuba, has become a secondary event in face of the great changes wrought in our relation to the Caribbean and more particularly to the momentous question of dominancy in the Pacific. The ownership of Hawaii and the Philippines (the former a direct outcome of the war also) are elements in this natural destiny of the highest importance. From this point of view, and there is nothing facing the world of greater import than the future of Eastern Asia, the war did much to put the United States in a position to meet the coming emergency. It also gave us a navy, an adequate army, and the necessary bases for action, if action be forced upon us. F. E. CHADWICK,

Rear-Admiral, United States Navy.

Note:— 1,682 officers and men under Gen. E. S. Otis arrived 21 August; three other detachments left San Francisco successively 19, 23 and 29 July, making a total of 641 officers and 15,058 enlisted men.

43. **United States — Territorial Expansion of the.** The territorial expansion of the United States dates from the peace treaty of 1783, the very treaty by which their independence was recognized and their boundaries named. There had been much uncertainty about the boundaries of the colonies for a considerable period prior to the War of the Revolution, and especially so


THE WORLD
SHOWING THE
TERRITORIAL ACQUISITIONS
OF THE
UNITED STATES
SCALE OF MILES ALONG THE EQUATOR
ARCTIC OCEAN
PACIFIC OCEAN
INDIAN OCEAN
ANTARCTIC OCEAN
NORTH AMERICA
SOUTH AMERICA
UNITED STATES
ALASKA
GREENLAND
RUSSIAN EMPIRE
SIBERIA
CHINESE EMPIRE
MONGOLIA
AUSTRALIA
OCEANIA
NEW ZEALAND
PHILIPPINE ISLANDS
HAWAII
BERING SEA
BAFFIN BAY
BARENTS SEA
ARABIAN SEA
WEST INDIES
BRITISH ISLES
Sahara or Great Desert
ARCTIC CIRCLE
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
ANTARCTIC CIRCLE
Longitude West from Greenwich
Longitude East from Greenwich

in years immediately preceding the Declaration of Independence. The early grants to the colonies were made "to the South Sea," by which was meant the Pacific Ocean, though it was not then supposed that the continent was more than a few hundred miles wide. Gradually, however, the French moved up the Saint Lawrence and down the Mississippi Valley, establishing their claim to the great central area, and the Spanish gradually extended their claims northward at the extreme west, so that the claims of the colonies that their territory extended to the Pacific gradually dwindled, in view of the fact that the mother country made no attempt to prevent these encroachments on the west. The increasing claims of the French in the Mississippi Valley and finally their claims to the Ohio Valley led to hostilities between the English and the French colonists and they were supported by their respective governments. In 1753, the French having begun the establishment of a military post at the present site of Pittsburg, George Washington was sent by the governor of Virginia to warn them that the territory was claimed by the English colonies and must not be occupied by the French. Their reply was that they also claimed the territory by exploration and settlement and would hold it. This led to an attack by the English in the following year, in which they were repulsed by the French, and this precipitated the war between the French and English, which resulted in the expulsion of the French from the continent. The treaty between the French and English governments, by which the French withdrew from continental America, was made in 1763, and fixed the Mississippi River as the western boundary of British territory. It subsequently developed that France had a few months before secretly ceded her claims west of the Mississippi to Spain. The acceptance of the terms of this treaty of 1763 by the British government terminated the claims of the colonies that their boundaries extended to the Pacific. By this same treaty of 1763, made between England, France, and Spain, Florida passed to the control of England, and as it was deemed advisable to divide it into two provinces or colonies, the British government concluded to add to the western section a narrow strip from the southwestern part of the great colony of Georgia. Accordingly a strip west of the Appalachicola River, which had been formerly a part of Georgia, was attached to West Florida, against the protest of Georgia. The war between Great Britain and France regarding the territorial area in America had also resulted in the transfer of the French colony of Quebec to British control, and in 1774 the British government attached all of the territory north of the Ohio River and west to the Mississippi to the province of Quebec, making it, for purposes of government, a part of that province. This gave great dissatisfaction to the people of Massachusetts, Connecticut, New York and Virginia, since each of these claimed that a part of the section north of the Ohio was within its original grant and should not be taken from them. And this was one of the many causes of dissatisfaction which finally culminated in the War of the Revolution.

Thus when the Revolutionary War closed there were several territorial questions to be settled, in making the peace treaty: first and most important, whether the country north of the Ohio was to remain a part of Quebec, or be recognized as still a part of the former colonies; second, whether the section which had been taken from Georgia at the southwest and added to Florida should be restored as a part of the territory of the United States, in view of the fact that Great Britain had meantime receded Florida to Spain; and, third, what should be the boundary at the extreme northwest. Virginia had held that her original charter gave her the territory north of the Ohio to the Mississippi River, including that lying west of the lakes, and besides that was the important fact that it had been occupied, in some degree at least, by the colonial forces during the War of the Revolution.

The result of these uncertainties as to boundary was that the commissioners sent to Paris to negotiate a treaty of peace with Great Britain were instructed to claim all of the territories in question, but to be guided by the French government in their work. These commissioners, Benjamin Franklin, John Adams, John Jay, and Henry Laurens, soon after their meeting, found a disposition on the part of the French government to advise that the British retain the country north of the Ohio, and even that the country south of the Ohio, between the Cumberland Mountains and the Mississippi, be declared neutral territory for the use of the Indians. As a result, the United States commissioners broke off their relations with the French and negotiated the treaty according to their own views. By the boundary lines finally determined they obtained the recession to the United States of the small strip at the southwest corner of Georgia, now the southern part of Alabama and Mississippi, also the entire country north of the Ohio to the Great Lakes and that section west of the Great Lakes to the Mississippi and as far north as the present boundary line. These may be properly said to be the first additions to the territory of the United States, since all of the area in question was more or less in dispute under the latest acts of the British government prior to the War of the Revolution and the organization of the 13 Colonies as the "United States of America."

The next addition to the territorial area of the United States, and that which is usually spoken of as the first addition to the territory of the United States, was the Louisiana Purchase. France had included the city of New Orleans and a small tract of country on the eastern bank of the Mississippi near its mouth in the territory ceded to Spain when she abandoned the continent of North America in 1763. This gave the control of the mouth of the Mississippi to the nation controlling this territory. Following the close of the War of the Revolution, the area west of the Alleghanies had rapidly increased in population, and it was essential that this population should have an opportunity to reach the sea by the Mississippi River. An agreement was made with the Spanish government in 1795 by which citizens of the United States should have the privilege of depositing their goods in New Orleans for transshipment abroad, without payment of duties, and that incoming goods should have similar privileges. In 1802, however, it became known that Spain had ceded the Louisiana coun-

try to France, by a secret treaty made in 1800, and this fact caused great alarm among the people of the United States, lest their privilege of reaching the ocean through the Mississippi should be lost. A resolution was introduced in Congress authorizing the President to seize the city of New Orleans, but a substitute was adopted authorizing the President to send a commission to France and offer $2,000,000 for the city of New Orleans. James Monroe was sent as the Special Commissioner and authorized to co-operate with our minister to France, Mr. Livingston. Napoleon, who was about entering upon war with the English, saw that his great possessions in America would be a source of weakness to him in such a war, and offered to sell the entire Louisiana territory to the commissioners. While they were not authorized to make such an agreement, they determined to assume the responsibility of doing so, and after some negotiation an agreement was made by which the entire territory was to be ceded to the United States for the sum of $15,000,000, of which $11,250,000 was to be in bonds of the United States, the remainder to be paid to citizens of the United States having claims against France. The treaty reached the United States in July 1803, a special session of Congress was called in the following October, and after two days of discussion the treaty was ratified, and in December the city of New Orleans and the vast territory thus acquired was turned over to the United States. The population at that time was about 100,000, of which about one half were whites, 10,000 mulattoes, and 40,000 negroes. See UNITED STATES — THE LOUISIANA PURCHASE.

The next addition to the territory occurred in 1810–12, in the form of a small section of territory which had been a part of west Florida during the time that Great Britain controlled Florida. After the recession of Florida to Spain by Great Britain, the English citizens of the western part of west Florida became dissatisfied, and especially so in view of the reports that Spain had sold west Florida to France. They held a convention in 1810, declaring themselves a free and independent State. A communication was sent to the President of the United States, who instead of recognizing the new republic, directed the governor of New Orleans Territory to take possession of the territory, basing this action upon a claim that the territory had been sold to France and should have been included with the cession of Louisiana Territory by France. The annexation does not seem to have been seriously objected to by the people of the area in question, but was met with protests on the part of both Spain and Great Britain. No further action was taken, however, and in 1812 the control of the United States was extended to another small section lying east of that occupied in 1810, this action being based upon claims similar to those upon which the occupation of 1810 was made. These two additions gave to the United States the small section by which Alabama and Mississippi now have a frontage upon the Gulf of Mexico.

The next addition to the territory of the United States, and that which is usually known as the second, was the purchase of Florida from Spain, in 1819. Florida had been continuously in control of Spain from the discovery to 1763, when Spain ceded it to Great Britain in exchange for a part of Cuba, which Great Britain had seized during the war with France, because of the aid which Spain gave to France in that war. In 1783 England receded Florida to Spain, and in 1785 Spain sold west Florida to France, and it was upon this fact of the ownership of that territory by France that the United States claimed that it was included in the cession of the Louisiana territory in 1803, and upon this claim was based the occupancy in 1810 and 1812 above described. Florida was greatly desired as a part of the United States, both for the purpose of extension of the slave area and because of the fact that the presence of this foreign territory alongside of that in which slavery existed resulted in constant friction between the people of the two sections. The escaping slaves from the adjacent territory of the United States found Florida a safe retreat and there was also much bitterness over the fact that Florida had been made the headquarters of a British force during the war of 1812–14. Repeated offers were made to the Spanish government for its purchase but without avail, but finally, in 1819, the Spanish ambassador at Washington signed a treaty by which Florida was to pass to the United States on payment of $5,000,000 in full extinction of the claims of certain American citizens against the Spanish government. The treaty was ratified in 1821 and the territory taken possession of by the United States, which in 1822 established the "Territory of Florida." See FLORIDA.

The next addition to the territory of the Union was that of Texas. It was desired as a part of the Union, especially by those interested in the extension of slave area and slave States. It was formerly a part of the Spanish colony of Mexico. In 1810 the people of Mexico revolted against Spanish rule, and in 1822 were successful, and in 1824 the Republic of Mexico was established. The two provinces, formerly known as "Texas" and "Coahuila," were made a single state of the new republic of Mexico, under the name of Texas. The desire of the people of the United States for this territory led to an offer of $1,000,000 to the Mexican government for its purchase in 1827 and another of $5,000,000 in 1829, but each was rejected. Meantime a large number of persons from the southern part of the United States settled in Texas, and in 1833 Texas attempted to obtain a peaceable separation from Mexico and independence, but without success. In 1836 Texas seceded from Mexico and established itself as a republic. In the election for president which followed, an almost unanimous vote was cast for annexation to the United States, but the application for admission, made by its minister at Washington, was not favorably received by Congress. In 1844 another treaty of annexation was made but rejected by the Senate. The presidential election in the United States which soon followed hinged largely on this question, and the sentiment was apparently in favor of annexation, and in January 1845, Congress passed a resolution giving "consent that the territory properly included within the Republic of Texas may be erected into a new State to be called the State of Texas." This was accepted by the congress of Texas and by popular vote in that Republic, and in December 1845, a joint resolution was passed in the Congress of the United States admitting Texas as a State. Thus, Texas passed from the position of an

independent republic to that of a State of the United States, without a treaty or without passing through the territorial stage which usually preceded the formation of States of the Union. See UNITED STATES — ANNEXATION OF TEXAS.

The next great step in the development of the territory of the United States was the favorable settlement of the pending question between the United States and Great Britain regarding the control of the Oregon Territory. This territory had been claimed by Spain, Great Britain and the United States on grounds of exploration, and been jointly occupied by Great Britain and the United States after 1818, pending a settlement of their respective claims. Meantime the treaty of the United States with Spain, made in the purchase of Florida, had resulted in the abandonment by Spain of her Oregon claim and the fixing of the boundary line between the Oregon country and Spanish territory which then included all of what is now know as California, New Mexico and Utah. This strengthened the claim of the United States to the Oregon country, and by 1846 the demand of the people of the United States for a settlement of the boundary line became so great that there was serious talk of war with Great Britain to determine the question. Finally, in the year 1846, a proposition was made by the British government fixing the boundary line on the 49th parallel and the Straits of Fuca. This was accepted and the Oregon country south of that line became an undisputed part of the territory of the United States. See NORTHWEST BOUNDARY.

The next addition to the national territory was what is known as the Mexican cession. A quarrel had arisen between Mexico and the United States, shortly after the annexation of Texas, regarding the boundary line between that area and Mexico, the Mexican Government holding that the Nueces River was the southern boundary line of Texas, while the United States held that the Rio Grande was the boundary. The result was the war with Mexico, in which the United States was successful in every engagement, and it was followed by the cession by Mexico of the great area which includes the present States of California, Utah, part of Colorado, a small part of Wyoming, and the territory of Arizona and a part of New Mexico. The eastern part of New Mexico was jointly claimed by Texas and by the United States as a part of the Mexican cession, and this claim and the control of about 125,000 square miles of Texas was settled by payment to Texas by the United States of $10,000,000. The area thus purchased from Texas now forms part of New Mexico, Oklahoma, Kansas, Colorado and Wyoming. The sum paid to Mexico for the magnificent area which was ceded to the United States at the close of the war was $15,000,000 in cash and a settlement of claims of citizens of the United States to the extent of $3,200,000.

The last addition to the contiguous territory of the United States was what is known as the Gadsden Purchase (q.v.). It is a comparatively small and unimportant strip of territory lying between the Mexican cession and Mexico, south of what is now New Mexico and Arizona. It was claimed by both Mexico and the United States, and the dispute was settled by a payment of $10,000,000 by the United States for the territory. The purchase was negotiated by the United States minister to Texas at that time, James Gadsden, hence the title, "Gadsden Purchase." The transfer occurred in 1853.

The first addition of non-contiguous territory occurred in 1867, by the purchase of Alaska (q.v.). The territory had been acquired by Russia, by discovery in 1741 and settlement in 1784, and a considerable industry in furs and shipbuilding developed. After the discovery of gold in California the Russians in Alaska traded with the people of California, especially prior to the development of transportation systems between California and the eastern coast, and in this manner the people of San Francisco became aware of the value of the fur business, and probably of the existence of the precious metals. The California members of Congress urged its purchase, bills to that effect were introduced in Congress, negotiations were opened with Russia through its minister in Washington, and after considerable delay the agreement was made and the purchase consummated in 1867, the purchase price being $7,200,000. The Russian government was moved to this sale of its territory in part by its disputes with Great Britain regarding boundary lines between Alaska and British-North America, and chiefly by the great distance at which the territory lay from its possessions in Europe and Asia.

The territory of Hawaii (q.v.) was the first island territory annexed by the United States. Negotiations for the annexation of these islands began in 1854, when a treaty of annexation was framed under President Pierce's administration, but the sudden death of the king of the islands before its completion terminated the negotiation. In 1876 a reciprocity treaty was made with the islands by which the products of the islands were admitted free of duty into the United States and those of the United States admitted free into the islands, and this developed commercial and other relations of the two communities very greatly. In 1893 a revolution occurred in the islands and application was made to the United States for annexation and a treaty framed and laid before Congress. It had not been acted on, however, at the close of the term of President Harrison and his successor, President Cleveland, withdrew it. On the inauguration of President McKinley the application for annexation was renewed, and after some delay Congress passed a joint resolution annexing the islands, and they were subsequently given a territorial form of government and made a customs district of the United States, so that all merchandise passes between them and the United States free of duty, just as it does between the various States of the Union.

Porto Rico (q.v.), Guam (q.v.) and the Philippine Islands (q.v.) were seized by the United States during the war with Spain, inaugurated in 1898 for the purpose of compelling that government to terminate her oppression of the people of Cuba. At the close of that war, in which the United States was successful, the islands were transferred to the United States by Spain, on the payment of $20,000,000 by the United States. While the treaty did not specify the precise purpose of the payment of the $20,000,000, it was understood that Porto Rico and Guam were retained by the United States under the rules of war, and that the payment of the sum named was with reference to the Philip-

pines. Porto Rico has been made a customs district of the United States and the commerce between that island and the United States is not subject to any customs duties. It has grown from about $4,000,000 per annum, before the transfer, to about $22,000,000 in 1903. The duty on commerce from the Philippines coming into the United States has been reduced 25 per cent, and bills for a further reduction are pending in Congress. Porto Rico is governed by officers appointed by the President and a legislature elected by the people. The Philippines are governed by a commission appointed by the President of the United States, the commission being made up in part from citizens of the islands and a part from citizens of the United States.

The island of Tutuila, one of the Samoan group in the south Pacific, passed under the control of the United States in 1899. The group had been for many years under a joint protectorate of the United States, Great Britain and Germany, but in that year the joint protectorate terminated, and the island of Tutuila, whose people had long ago expressed a desire for annexation to the United States, was annexed. The island is small, its chief importance being the possession of a fine harbor, the best in the south Pacific. See SAMOAN ISLANDS.

EXPANSION OF THE TERRITORY OF THE UNITED STATES FROM 1800 TO 1901:

	Year	Area	Cost
Louisiana Purchase	1803	875,025	$15,000,000
Florida	1819	70,107	*a*6,489,768
Texas	1845	389,795	.....
Oregon Ter.	1846	288,689	.....
Mexican cession.	1848	523,802	*b*18,250,000
Purchase from Texas	1850	(*c*)	10,000,000
Gadsden Purchase	1853	36,211	10,000,000
Alaska	1867	599,446	7,200,000
Hawaiian Is.	1897	6,740	.....
Porto Rico	1898	3,600	.....
Guam	1898	175	.....
Philippine Is.	1899	143,000	20,000,000
Samoan Is.	1899	73	.....
Addl. Philippines	1901	68	100,000
Total area added		2,936,731	$87,039,768

(*a*) Includes interest payment.
(*b*) Of which $3,250,000 was in payment of claims of American citizens against Mexico.
(*c*) Area purchased from Texas, amounting to 123,784 square miles, is not included in the column of area added, because it became a part of the United States with the admission of Texas.

See also UNITED STATES — THE COLONIAL AND TERRITORIAL SYSTEM OF THE.

O. P. AUSTIN,
Department of State, Washington, D. C.

44. United States — Immigration to the (1789–1904). The causes which operated before the Revolution to bring a small stream of European emigrants to the United States continued to operate after the establishment of the Federal government. Though no trustworthy records were kept in the early history of the republic, it is estimated that from 1783 onward the number of immigrants to this country was about 4,000 a year till 1794, when, as a result of the French-English war, the number was increased to 10,000. After that date it dropped to about 6,000 a year till 1806, when, as a natural result of the British and French continental blockades and of the American Embargo, it was reduced practically to nothing for the next 10 years. Then, beginning with 1816, the passenger arrivals, including returned Americans, reached about 8,000; and in the following year the number bounded up to 22,240. The large number of immigrants flocking to the country about this time produced considerable hardship incident to overcrowding. At this juncture the first legislation concerning immigrants was enacted by Congress, which simply provided that a record should be kept of the number of passengers in each customs district, registering the sex, age, occupation and country of birth. Since the government encouraged immigration as increasing the wealth and developing the resources of the country, this act of March 1819 was not in the nature of a restriction, but was intended merely as a record of the arriving aliens. Accordingly from 1 Oct. 1819 an account has been kept at all the customs ports of the number, sources, and conditions of all immigrants to the United States. The record will be found in the table below:

IMMIGRATION TO THE UNITED STATES BY YEARS.

Year ending 30 Sept.		Year ending 30 June	
1820	8,385	1860	133,143
1821	9,127	1861	142,877
1822	6,911	1862	72,183
1823	6,354	1863	132,925
1824	7,912	1864	191,114
1825	10,199	1865	180,339
1826	10,837	1866	332,577
1827	18,875	1867	303,104
1828	27,382	1868	282,189
1829	22,520	1869	352,783
1830	23,322	1870	387,260
1831	22,633	1871	321,350
1832 (to 31 Dec.)	60,482	1872	404,806
1833 (Jan. to Dec.)	58,640	1873	459,803
1834	65,365	1874	313,339
1835	45,374	1875	227,498
1836	76,242	1876	169,986
1837	79,340	1877	141,857
1838	38,914	1878	138,460
1839	68,069	1879	177,826
1840	84,066	1880	457,257
1841	80,289	1881	669,431
1842	104,565	1882	788,992
1843	52,496	1883	603,322
1844	78,615	1884	518,592
1845	114,371	1885	395,346
1846	154,416	1886	334,203
1847	234,968	1887	490,109
1848	226,527	1888	546,889
1849	297,024	1889	444,427
1850	310,004	1890	455,302
1850 (1 Oct. to 1 Dec.)	59,976	1891	560,319
1851 (Jan. to Dec.)	379,466	1892	479,663
1852	371,603	1893	439,730
1853	368,645	1894	285,631
1854	427,833	1895	258,536
1855	200,877	1896	343,267
1856	195,857	1897	230,832
1857 (to 30 June)	112,123	1898	229,299
		1899	311,715
Year ending 30 June		1900	448,572
1858	191,942	1901	487,918
1859	129,571	1902	648,743
		1903	857,046

It is to be noted: first, that up to 1856 the record includes all "alien passengers arrived," and does not distinguish immigrants from passengers, so that a reduction must be made from the total; second, that the immigration overland from Canada and Mexico is not included in these figures. For example, in the census of 1900 Canada is given as the birthplace of 1,183,255 persons, and Mexico as 103,445. An examination of the table reveals the fact that

the record shows several well-defined periods, with notable fluctuations. The first period extends from the beginning to 1826 inclusive, when the maximum seems to have been about 10,000 (reached in 1794, 1825, and 1826). The second period extends from 1827 to 1831, when the maximum is 27,382, the average being more than double that of the first period. This increase is perhaps explained by the enormous influx of Europeans to this country as the natural result of the wretched industrial conditions in Europe during the time of the Holy Alliance. The third period includes the decade from 1832 to 1842, when the tide of immigration is trebled or quadrupled, save a considerable ebb in 1838 due to the panic of the preceding year. After this period, when steamboat navigation and railroads began to render the fertile plains of the West accessible, such abnormal conditions as the Irish famine and the California gold discoveries sent immigration up by leaps and bounds till 1854. The flood of immigration that swept over the country during these years, demoralizing politics, trade and industries of all sorts, gave rise to the anti-foreign agitation; and this combined with the business depression of 1857 and the Civil War, which followed soon after, to reduce the number of immigrants greatly. However, after the war when the country entered upon a new era of industrial enterprise offering an almost boundless field for laborers, the tide of immigration again rose rapidly till 1873, when, under the influence of the panic and the hard times that followed, it once more receded. But, with the revival of business in 1880, foreigners again flocked to our shores in larger numbers than ever before, and immigration reached a high-water mark (669,431) in 1881. Since that year there has been a steady stream pouring into the country, save during the period of business depression from 1894 to 1898. In 1903 immigration reached the unprecedented figures of 857,046.

Most of the early immigrants came from Great Britain, a fair number from Germany, but very few from other European countries. In 1850 Great Britain furnished about 60 per cent of the immigrants and Germany 584,000, or 36 per cent. Thus 96 per cent of the immigrants in 1850 were of Teutonic blood, with the Anglo-Saxon element predominating. The proportion was very much the same in 1860. But in 1870, while the totals were much larger, the British percentage was falling and that of the other foreign elements was increasing. In 1880 the British contingent, including the Canadian, though larger in the grand total than before, had dropped to 47.5 per cent, the German to 30, but a considerable new element had arrived of Bohemians, Poles, Scandinavians, Italians, and Russians. In 1890 the British contingent had fallen to 29 per cent, or 2,700,000; the German increased to 33 per cent, or 3,000,000; while the number of Poles, Russians and Bohemians in the country amounted to 450,000, the Italians to 182,500 and the Scandinavians to 933,000. In 1900 the Slav element had reached 1,000,000, or nearly 10 per cent of the foreign-born population of the country, the Scandinavian over 1,000,000, the French including French-Canadian 500,000, the Italian nearly 500,000, the Mexican over 100,000, while the British had sunk to 19.4 and the German to 14 per cent. Within the last three years (1901–3) the Teutonic element, even including the Scandinavian, has greatly diminished. But from the countries of southern and eastern Europe have come nearly as many immigrants during these three years as came during the entire preceding decade.

In 1864 Congress passed the first immigration act, which was designed to promote, not to restrict, immigration; but this act was repealed in 1868. In 1882, the year after immigration reached its high-water mark, Congress passed the first restrictive act barring out criminals, insane, paupers, and other undesirable classes. In 1885 a more drastic act was passed. This act did not operate as successfully as was expected, for while it was aimed at strike-breakers and persons of the baser sort, it has also militated against the better classes of immigrants, such as artists, architects, musicians, and even clergymen. It was therefore later modified and in 1891 was extended to all "assisted" immigrants and to other classes. The act of 3 March 1903 is more drastic and requires a preliminary inspection at the point of departure and gives the government the right to deport, within two years after arrival, any immigrant landed in violation of the act.

EDWIN W. BOWEN.
Department of Latin, Randolph-Macon College, Ashland, Va

45. United States — Suffrage in the. Suffrage means participation in government by voting. There are two theories in regard to suffrage: (1) That it is a privilege granted by the State to individuals; (2) that it is a natural, inherent right belonging to every man. The former is the usually accepted theory; the latter, the outcome of the revolutionary movements of the 18th century, is to-day generally discredited. Suffrage in the English colonies in America was restricted as in England. Virginia began in 1619 with manhood suffrage, but in 1655 and 1670 restricted the suffrage to "free-holders and householders." Similar restrictions existed in the other Southern colonies and in the middle colonies. New England, notably Masachusetts and New Haven, had strict religious tests. Only "freemen" could vote and only members in good standing of some Congregational church could be "freemen." Consequently the majority of the male inhabitants were excluded, the entire list of "freemen" in Massachusetts between 1630 and 1691 numbering only about 2,000. When England secured better control over the New England colonies the suffrage was given to owners of estates valued at £40 or freeholds worth 40*s.* a year. During the 18th century the freehold test became general. Roman Catholics, Jews, and in New England, Quakers, were generally disfranchised. There was also a moral qualification in New England — a voter must be "a person of civil conservation and quiet and peaceable behavior," not "an opposer of the good and wholesome laws of the Colony." In the South, no convict could vote. Each colony had its own naturalization laws until Parliament passed a uniform law (1746) requiring the Protestant faith and seven years of residence. The suffrage was extended very slowly, and when the Union was formed, in 1787, in each State it was very limited. The qualification was usually a freehold of 40*s.* to £3, or an estate worth £20 to £60, or ownership of a certain number of acres. It has been estimated that in 1787 there were in America

150,000 electors from a population of 5,000,000 which a hundred years later would have furnished 700,000 to 1,000,000 voters. The religious restriction soon disappeared,— last in South Carolina in 1797. Under the Constitution each State regulated its own citizenship. The influence of revolutionary theories upon politics had much to do with broadening the suffrage. In New England, where most men were white, the "rights of man" were believed in; in the Middle and Southern States, where blacks were numerous, the rights of white men alone were recognized. The new Western States offered citizenship on easy terms, thus stimulating the advance of democracy in the older States. Rival political parties wanted more votes, and all white men were gradually enfranchised. The last property test disappeared in Louisiana in 1845. The abolition agitation hastened enfranchisement of all whites by asserting the "rights of man." Before the Civil War only Connecticut and Massachusetts restricted white suffrage. Alarmed at the rapid increase of foreigners they enacted in 1854 and 1856 educational qualifications for voters.

Negro Suffrage.— The extension of suffrage to negroes was a result of the Civil War. Prior to the Revolution, though there were no laws against it, it is not known that any negro ever voted in the New England or Middle colonies, but a few free negroes voted in Maryland, South Carolina, and probably in North Carolina. Between the Revolution and the Civil War free negroes voted in several States. They were disfranchised in New Jersey, 1807; Maryland, 1810; Tennessee, 1834; North Carolina, 1835, and Pennsylvania, 1838. The elections of two Tennessee congressmen, John Bell and Cave Johnson, were decided by the ballots of free negroes. The agitation of abolition societies was the principal cause of the disfranchisement of free blacks. Vermont, Massachusetts, New Hampshire and New York alone before 1861 did not disfranchise them. The 13th Amendment (1865) to the United States Constitution merged the negroes into the political population for purposes of representation. A movement in the South (1867) to give the negro a limited suffrage was stopped by the Reconstruction Acts (1867) which gave the ballot to the negroes in the South, though as late as 1868 most of the Northern States gave them no political privileges. The 14th Amendment (1868) while disfranchising the prominent whites of the South, put a premium on the enfranchisement of the blacks by the State governments by offering increased representation in Congress. The 15th Amendment (1870) provided against discrimination on account of race or color and practically resulted in universal manhood suffrage. The amendments apply to the whole United States. Political corruption and misgovernment followed the enfranchisement of the negro, and from 1868 to 1876 the Southern whites were engaged in overturning the governments ruled by the negroes, thus beginning a thorough-going reaction against negro suffrage. From 1876 to 1890, the whites devoted themselves to destroying in the South the Republican party organization which controlled the negro vote. During this period the negro vote was restricted by centralization of the administration in Louisiana and North Carolina; by requiring the payment of taxes in Virginia, Arkansas, Georgia, Florida, Mississippi and Tennessee; and by complexity of election laws — Australian ballot system, registration, etc.— in Alabama, Arkansas, Virginia, Tennessee and Mississippi, amounting practically to an educational qualification. About 1890 began a movement to disfranchise negroes by changes in the State Constitutions. Upon readmission to the Union (1868–70) a fundamental condition imposed was that their constitutions should never be revised so as to deprive any one of the right of suffrage. This condition was ignored by the Southern States and the amendments were evaded. The suffrage clauses in these new Southern constitutions are alternative: (1) the "understanding" clause requires the voter to be able to read or understand when read to him any section of the Constitution; (2) the "grandfather" or "old soldier" clause excuses from other tests those who have served in any war and their descendants, or those who were voters before 1 Jan. 1867, and their descendants; (3) a clause requiring a taxpaying and property qualification from those disqualified under other clauses; (4) the "good character" clause requiring the voter to be of good moral character. Mississippi (1890) invented the "understanding clause," giving it to South Carolina, Alabama, and Virginia; Louisiana the "grandfather" or "old soldier" clause (1898) giving it to North Carolina, Alabama, and Virginia. Alabama (1901) discovered the "good character" qualification, passing it on to Virginia. Practically all the Southern States have a property and tax paying qualification for voters, which, with the educational test, will by 1905 become the sole qualifications. The evasive provisions are temporary, intended only to disfranchise the negroes, while including the whites. The effect of these restrictions is remarkable, disfranchising in each State that has restricted the suffrage from 30,000 to 60,000 whites and practically all the blacks. The tax paying requirement is the most effective in excluding both whites and blacks. Regarding the conflict of these provisions with the United States Constitution and laws, the Supreme Court decided that the fundamental restriction imposed upon readmission is unconstitutional, and that it is the duty of Congress to enforce the 14th and 15th amendments, which probably will not be done. The evil results from negro suffrage during Reconstruction caused Congress to hesitate before again interfering in affairs of the Southern States.

Suffrage in the Territories.— In the Territories suffrage is regulated by Congress, which may delegate its authority to the territorial legislature. In the District of Columbia, white tax payers voted from 1802 to 1855, when the suffrage was extended to all white men, and in 1867 to white and black males excepting Confederates and Confederate sympathizers. Misgovernment and corruption followed and in 1878 all voters in the District were disfranchised by Congress, local government now being carried on by a board of commissioners. Alternate educational or property qualifications exist in Connecticut (1854); Massachusetts (1856); Wyoming (1889); Maine (1891), and Delaware (1897). The United States confers citizenship upon the alien by naturalization; the State confers the right to vote. In many States aliens

are allowed to vote after they have declared their intention to become citizens. Indians must become naturalized before voting. California allows no Chinese to vote.

Woman Suffrage.— Women voted in New Jersey in 1776–1807. The renewed agitation (1830–67) in regard to "natural rights" caused a demand that women be allowed to vote. In 1848, the first woman's suffrage convention demanded the ballot, basing their claims on the principles of the Declaration of Independence. In 1866, the first petition for woman suffrage was sent to Congress. In 1868, the New England Woman's Suffrage Association was formed, and in many States the political parties favored the movement. In 1869, Wyoming Territory enfranchised women, Utah in 1870, Colorado in 1876, Washington in 1883, and Idaho in 1896. In 1882 women in Utah Territory were disfranchised by the Edmunds law, but in 1890 the State of Utah again gave them the ballot. At present they enjoy equal suffrage with men in four States, Wyoming, Colorado, Utah, and Idaho, and in 18 States of the North and West women vote in school elections. In two States, Montana and Iowa, women taxpayers may vote upon issuing municipal bonds. In Louisiana women taxpayers may vote upon questions relating to public expenditure. It is said that women usually vote the Republican ticket. Consult: Bishop, 'History of Elections' (1893); Thorpe, 'Constitutional History of the American People' (1898); Thorpe, 'Constitutional History of the United States' (1901); Cleveland, 'The Growth of Democracy' (1898); Bryce, 'American Commonwealth' (1897); Hart, 'Actual Government as Applied under Amrican Conditions' (1903).

WALTER L. FLEMING,
Professor of History, University of West Virginia.

46. United States — History of the Tariff. Almost from the organization of the government of the United States, duties upon articles imported into the country have been a part of the fiscal system. These duties have nearly always carried with them more or less of a protective influence, although at times not imposed for that reason, and at other times enacted by administrations avowedly opposed to the protection principle. Before 1816, and between 1846 and 1860, were the nearest approaches to a free trade basis for foreign commerce, especially in the earlier period. At no time, however, has such foreign trade really approximated a genuine free trade basis, and the term as used in connection with American commerce is more or less misleading.

At such times as the so-called free traders have come into political power they have failed to enact laws which carried into full effect radical free trade theories. Beginning with the tariff for revenue, and without much thought of protective influence, the system soon developed into a combination of revenue and protection. The revenue feature has been given the most prominence when the free trade party has come into power, and the protection feature has been brought to the front in turn whenever its adherents have secured control of the legislative machinery.

Whereas in the past there have been sharp dividing lines between political parties representing the free trade and protection idea, this is no longer true. Free trade is no longer an issue in American politics. The question, so far as the tariff is concerned, being rather one of high or low duties, the former being for the avowed purpose of protection, and the latter carrying what is termed incidental protection. If it is possible at this time to define the tariff position of the two great political parties of the United States it must be along these lines. The need for money, occasioned by the expense of war, has generally been met not only by an increase in internal taxation, but by an increase in import duties. This was particularly notable after the War of 1814, and the Civil War of 1861. Duties imposed by reason of war necessities have seldom been reduced subsequently to previous levels, hence temporary needs have aided materially in building up the high level of protection now generally accepted as the fiscal policy of the United States.

From 1789 to the present day there have been nearly 200 acts and joint resolutions of Congress affecting import duties. A large majority of these have been of minor importance, or merely amendatory to laws which were retained almost intact. The necessity for providing national revenue was the first consideration with the American Congress. That body met 6 April 1789, and two days later the House of Representatives resolved itself into a committee of the whole on the state of the union. Within 70 hours of the opening of the organization, James Madison introduced the subject of the tariff as one which appeared to him to be of the greatest magnitude, and one requiring the first attention of the legislative body. He said: "The deficiency in our treasury has been too notorious to make it necessary for me to animadvert upon that subject. Let us content ourselves with endeavoring to remedy the evil. To do this a national revenue must be obtained, but the system must be such a one that, while it secures the object of revenue, it shall not be oppressive to our constituents. Happy it is for us that such a system is within our power, for I apprehend that both these objects may be obtained from an impost on articles imported into the United States."

On closing his speech Mr. Madison offered a resolution, declaring it to be the sense of the committee that specific duties should be levied on spirituous liquors, molasses, wines, teas, sugars, pepper, cocoa and spices, and an ad valorem duty on all other articles; and also a tonnage duty on American vessels in which merchandise was imported, and a higher rate on foreign vessels. The following day the subject was again taken up, and continued to be the all absorbing topic of debate from the date Mr. Madison introduced his resolution until 17 May following, when the House agreed upon a bill and ordered it sent to the Senate. The Senate took up the bill on the 18th, and it was under consideration until June 11, when it was concurred in with sundry amendments. The House refused to concur and asked for a conference. The conference committee effected a compromise, which resulted in a lowering of some of the proposed duties.

The bill thus agreed to by both houses of Congress became a law by the approval of the President 4 July 1789, and thus was completed the first act in the building up of the present tariff system of the United States. The system

as it stands to-day, in the duties imposed and in the machinery of its application, is the outgrowth of a century of experiment and experience, and the advent into power of the most extreme low tariff party would do little more than lower some of the rates without disturbing to any great extent the complex organization provided for the administration of the customs houses. The tariff systems of nearly all protection countries are now modeled after that of the United States, and the effect of the policy of the latter country upon international commerce has been so powerful as to practically establish all existing channels of trade of any great importance.

Germany became a protection country by virtue of following the example of the United States at a time when German industrial affairs were faced with a crisis. The only great nation in the world which in 1904 still stood for an ostensibly free trade basis in its foreign commerce was the United Kingdom, and that country, struggling in the grasp of severe industrial depression, began to doubt the wisdom of its fiscal policy. This doubt obtained such strong hold upon the minds of the British people that a movement for the protection of British producers gained sufficient headway to warrant the prediction that within a reasonable time the example of the United States will also be followed by the United Kingdom to the extent of adopting a system of moderate import duties.

The tariff legislation of the American Congress may be grouped in a general way into a number of epochs. The first may be said to extend from 1789 to 1816; the second, from 1816 to 1832; the third, from 1832 to 1846; the fourth, from 1846 to 1860; and the last, from 1860 to the present time (1904). Opinions may differ as to whether there was any element of protection intended in the law of 1789. Whether there was or not, the operations of that law resulted in the passage of a tariff law in 1816, in which is embodied a distinctly protective policy. The duties imposed by the law of 1816 are lower than those which would now be considered as purely of a revenue character. The highest rate imposed by that law was 20 per cent. This was an increase over the rates established by previous acts, and was brought about more by the need for money to pay the interest charged on the war debt than by a popular demand for more protection. The law carried with it, however, sufficient protection to illustrate the principle and demonstrate its possible benefits to struggling industries. Popular sentiment became aroused in protection directions, and here may be said to have begun the first general movement in favor of a protection policy not only for revenue purposes but to secure immunity for home industry and labor against foreign competition.

The tariff law of 1824 was the outcome of a protection campaign, and in 1827 the duties were still further increased on woolens, around which class of manufactures most of the agitation for protection had arisen. A still stronger element of protection was contained in the law of 1832 and protection may be said to have prevailed in that and previous acts for a period of about 20 years. The duties imposed during that period, however, would not be regarded, in most instances, as high compared with the duties now collected on certain schedules. Between 1832 and 1860 protection and free trade alternately made their influence felt upon public opinion, and consequently in legislation. The record of Congressional action shows considerable vacillation, though at no time was the protection principle in danger of being abandoned. It had apparently become accepted as a basis for the fiscal system of the new country.

Low tariffs were succeeded by high tariffs, which in turn yielded to the agitation of the moment and were followed by lower rates. It was during this period that the great territorial development of the United States took place. The discovery of gold in California, the settlement of vast areas of western lands, and the coming of nearly all the new wealth of the country from the soil, obscured to a greater or less degree the real effects of any changes which were made in the tariff policy of the country. The law of 1832 was distinctly a protective measure, carrying high duties on cotton, woolen and iron imports, the principal articles concerned in any tariff legislation.

What is known as the compromise act was passed in 1832, this being an agreement between Clay and Calhoun, the leaders of the protection and low tariff parties, respectively. That law, while retaining a large element of protection, provided for a gradual reduction of duties upon a sliding scale. In 1842 a tariff law was passed by the Whigs as a party measure. This law carried high duties and was avowedly protective in its purpose. It remained in force but four years and was followed by the tariff law of 1846 enacted by the Democrats and based upon the Treasury report made by Secretary Walker in 1845. Secretary Walker was allegedly in favor of free trade, and his bill was referred to as a free trade measure. Notwithstanding this, some of the import duties were placed as high as 100 per cent and 30 per cent duty was retained upon nearly all of the principal articles of trade which had been in controversy for the 50 years preceding.

The act of 1846 remained in effect for 11 years, and in 1857 a still further reduction of duties was made. This law was passed without perceptible opposition owing to the fact that the revenue of the country was very large, and the treasury enjoyed a surplus of funds evidently calling for a reduction in national income. The average duty on the articles which were protected was reduced from 30 to 24 per cent, but the reduction was not so large as appeared upon the face of the law, for cotton manufactures, which in the act of 1846 were included in a schedule which only paid 25 per cent, were transferred to the schedule which had previously paid 30 per cent; hence a reduction of only one per cent was made in the import duty paid by this important class of competitive goods.

The law of 1857 only remained in force four years, for in 1861 came a revolution in the affairs of the country brought about by the Civil War. In the 30 years preceding, therefore, the country had conducted its fiscal affairs upon a varying basis. Beginning with a comparatively high protection policy in 1832, duties were gradually reduced until 1842 when, for a very brief period, the country approached closely to a free trade basis. From 1842 to 1846 protection again prevailed. In 1846 free trade, as it was called, controlled the situation, though it would be fairer to call it moderate protection, as the import duties exacted were not inconsiderable. In

1857 the protection given to domestic products was still further moderated and this law remained in force until the tariff legislation of 1861. In that year was enacted what was then and for some years afterward referred to as the "war tariff," though it was long ago accepted as expressing the permanent policy of the United States so long as the protection or Republican party should control the legislation of the country.

Before the Civil War a system of duties had been imposed which were very moderate compared to those the American people are now accustomed to. For a number of years immediately preceding the war the tariff was arranged upon a basis as closely approaching free trade as the economics of the country seemed to warrant. The Democrats, however, did not follow free trade principles in the framing of these laws, for many non-protective articles, such as tea and coffee, which might have been used to produce revenue were admitted free of duty. Iron and manufactures of iron, cotton goods, wool and manufactures of wool, carried an import duty of 30 per cent, and duties were also levied against steel, copper, lead and other articles of more or less competitive nature. In the law of 1857 the highest protective duty was 24 per cent. Nearly all raw materials were admitted free, and the duties on all manufactured articles were established at the lowest level which had prevailed since the beginning of the century.

The great change in the policy of the country in the matter of import duties came in 1860. It was in the winter of that and the preceding year the House of Representatives passed what is known as the Morrill Tariff Act of 1861. It was not until the next session, that of 1860–1, that this act received the assent of the Senate and became a law. This tariff legislation originated in the House of Representatives before a time when it could be charged with being a war measure. In fact, its promoters declared it to be their intention merely to restore the rate of duties which had prevailed in 1846. The most important change made in this bill was the substitution in many instances of specific for ad valorem duties, a change which generally results in a higher rate of impost. The iron and wool manufacturers benefited greatly by the passage of this law for it carried with it notable increase of protection for their output. This measure had hardly become a law when the Civil War began, and immediately the attention of Congress was centred upon the raising of additional revenue.

For the four years following no extra or regular session of Congress was held without many increases being made in the duties upon imports. The tariff act of 11 July 1862 increased the duties all along the line, for the avowed purpose of outsetting the internal taxation upon industry made necessary by war expenses. The protection idea, however, controlled largely in raising the schedules as set forth in this measure, and American manufacturers then received the highest degree of protection yet afforded them. In 1864 the import duties were again increased. This was done primarily, as before, to increase the revenue of the government, but as the men who framed and managed the bill were high protectionists, the law as enacted reflects their intention to give American industry the fullest measure of protection which Congress would allow. The average rate of duty under the law of 1862 had been 37.2 per cent, and under the law of 1864 the average rate was raised to 47.8 per cent. When the Morrill acts were passed, it was not believed that they represented a policy of high protection which was to be permanent. They were then regarded merely as necessary revenue producing measures so constructed as to afford protection to American industries while furnishing this revenue.

Immediately following the war, all branches of the fiscal policy received immediate attention except that dealing with the import duties. The schedules established during the war remained in force until the next general revision of the tariff in 1883, and by that time they had ceased to be regarded as war measures by the people, and had been adopted as a recognized part of the fiscal system of the United States when in its normal condition. The financial stress of the Civil War may, therefore, be said to have resulted in the present high protection policy of the United States. The tremendous growth of manufactures and the generally favorable operations of the law of 1864 produced an impression throughout the country that high protection was beneficial, and the people accepted it willingly. In fact, in a number of instances import duties have since been raised above those imposed by what is known as the "war tariff." This is particularly notable in the case of the wool schedule, one of the most complicated in the tariff system. These increases were made in the Tariff Act of 1867, and the main features of this bill were retained in the acts of 1883 and 1890, and after the brief period of lower tariff brought about by the Democratic measure of 1894 were readopted in the measure of 1897, the one now in force (1904). In 1882, a commission was created to consider a revision of the tariff, and the bill of the following year was based upon the report of this commission. The wool and iron schedules, around which all tariff agitation has gathered since the beginning, received the most benefit from this law. There were some slight reductions on raw materials.

No consistent policy was evident in the framing of the law of 1883, it apparently having been a measure controlled by the high protectionists, who were then animated by a desire to meet in some degree the wishes of those favoring a more moderate tariff. It was not until seven years later, or 1890, that another general revision of the tariff was undertaken. A number of measures were proposed in the meantime, but did not receive much encouragement. It was in this period that Mr. Morrison of Illinois, originated his "horizontal" reduction bills, all of which met with defeat, being opposed by the members of his own, the Democratic, party, as well as by the Republicans. The tariff question came to the front again with the Congressional session of 1887–8. President Cleveland's message in the fall of 1887 was devoted almost entirely to the tariff, and he took a decided stand in favor of general reduction and in favor of free raw materials.

The so-called Mills bill, expressing the ideas of President Cleveland and his followers, was passed by a Democratic House, but failed to become a law through the Senate being Republican. A bill originating in the Senate proposed

still further increases of protective duties and the campaign of 1888 was conducted on the tariff issue. The Republicans were triumphant and interpreted the result at the polls to be a verdict in favor of protection. This election resulted in the final enactment in October 1890, of what has been popularly known as the McKinley Bill. (See McKinley Act.) As usual the controversy raged fiercest over the woolen schedules, and no tariff has been more fully debated, or to such wearisome length, as this bill which finally became a law.

Immediately after the passage of the McKinley Bill, the Democrats were successful at the polls. In the fall of 1890 Democratic majorities were returned in the Congressional elections, and in 1892 President Cleveland was again elected, after making a compaign in which little was talked of except the tariff. In the period immediately following, the tariff question was obscured, however, by the sudden appearance of a currency issue, and in 1893 severe financial depression throughout the country centred public attention almost exclusively upon the currency issue. The Democrats had a very small majority in the Senate, and many Democratic senators hailed from States which benefited materially by protection. A Democratic measure lowering the tariff schedules was reported to the House in December 1893. This measure is popularly known as the Wilson Bill. Owing to the narrow majority possessed in the Senate by the party in power, and the conflicting interests affected by the measure, it was radically amended before it stood any chance of enactment. The House was forced to accept the Senate amendments and the bill as thus shaped became a tariff law of 1894. It went into effect 28 August, and President Cleveland expressed his displeasure and disapproval by permitting the bill to become a law without his signature.

The Wilson Bill was a radical change in the long existing tariff policy of the United States. Free wool was its most important feature and was looked upon as a test of the wisdom of free raw material. There were also marked reductions in the schedule imposed on manufactures of wool. The iron and steel industries also suffered a marked reduction in the duties on competitive products. By the time the Wilson Bill went into effect the country was in most desperate financial straits; crops were bad, and the mining industry of the west was at a low ebb. Disaster was general throughout the western States, many causes serving to emphasize it. Owing to this combination, it is difficult to justly estimate the economic effects of the changes in the tariff, but the general impression created upon the country was unfavorable to the measure, and reflected severely upon the economic theories advanced by the Democrats.

The presidential campaign of 1896 was fought upon the currency issue purely and simply, for the free coinage of silver was advanced as the only question before the people, and advocated as a remedy for all the ills under which the country was then laboring. Discussion of the tariff was thus practically eliminated from the controversy, and the Republican party, standing as it did for the gold standard, won an overwhelming victory on that issue alone and came back into power. The people accepted the argument of the high protectionists to the effect that the black years of 1893–4–5–6 were due almost entirely to the enactment of a low tariff bill by the Democrats in 1894, and the Republican party met with every encouragement to reassert the protection principles of the McKinley Act and raise the import duties once more to rates approximating at least those which had prevailed before the panic. President McKinley called Congress together in extra session in 1897 for the sole expressed purpose of treating of tariff and revenue. The campaign of 1896 had been carried on with the currency as the sole issue, but the first act of the new Congress was one affecting the tariff.

A bill had been prepared unofficially before the House was organized, and the third day after the session began witnessed the introduction of a measure known as the Dingley Bill, which stands without material modification as the law of 1904. The bill was passed within two weeks and without very much consideration by the House as a whole, the committee plan being accepted entire. Its passage was effected by strictly party vote, and under the severe rulings of Speaker Reed. In the Senate, as usual, there was more delay. After remaining in the committee for a month it was reported with some amendments. As the bill finally passed the Senate it contained nearly 900 amendments, but followed the report of the House committee rather than that of the committee of the Senate. An agreement was reached in conference and the bill enacted into law 24 July 1897.

Under this act the duties on wool were restored to an even higher level than ever before. The duty on hides was re-imposed, cotton manufactures did not receive quite as high a degree of protection as in the McKinley Bill, but silks and linens secured the maximum of protection. Some attention was paid to the agricultural interests in a duty on flax and lower duties were imposed on imported goods consumed in the pursuit of agriculture than were common to the law of 1890. The duties on the iron and steel schedules were not increased in proportion, for these industries had remained prosperous under lower tariffs, and popular sentiment was already forming in opposition to high protection for articles controlled by industrial combinations. In the Dingley Law were revived the provisions of the McKinley Law providing for reciprocity in foreign trade, but a time limit of two years was placed upon the operation of this clause, and owing to the opposition of the Senate to such reciprocity treaties as were subsequently negotiated by the State Department no results were achieved thereby.

The enactment of the tariff law of 1897 was the result of a well-defined determination on the part of the people as expressed at the polls to maintain the system of protection which had so long been in force and under which the industries of the country had apparently benefited most materially. That the American people were satisfied with the action of Congress in re-establishing protection at a high mark is shown by the return of the subsequent national election in 1900, when the Republican Party was again decisively triumphant in its appeal to the voters. It is true that the money question was again to the front in 1900, but with far less virulence than in 1896. General conditions throughout the country in 1900 were most excellent, with every prospect for a continuation

of the same. The contrast of these years of plenty to the lean years when the Wilson Bill was in force could not fail to appeal not only to the imagination, but to the pockets of the electorate, and whether the deductions as to causes were correct or not, it is not to be wondered that the average voter accepted apparent results without questioning too closely the reasons why.

Since the enactment of the tariff law of 1897 the United States has come into possession of important areas of new territory, which while not held to be integral portions of the United States are considered by the people as entitled to the full benefits of American protection and free intercourse with the government country. Industrial interests which would be seriously affected by suddenly applied free trade with large tropical areas, and other interests favoring a narrower economic policy have prevented the enactment of laws giving unrestricted trade privileges to the Philippines.

Considerable progress has been made along these lines, however, as commerce is now entirely unrestricted between the United States and Porto Rico, and material reductions have been made in the duties assessed against Philippine products. No tariff legislation of importance has been enacted by Congress since the law of 1897 with the exception of these concessions made to American territory, and the ratification of a treaty with Cuba, which provides for a reduction of duties on Cuban products entering the United States, this reduction being given in consideration for reductions of equal value allowed by Cuba upon goods imported from the United States. This legislation in favor of Cuba can not be regarded as an expression upon the tariff question, for it was dictated more by the peculiar relations between the two countries and the understood pledge made by the United States in 1898 to the effect that when Cuba should have secured her independence, the United States would extend a helping hand to rehabilitate the distressed industries of that island.

A large number of reciprocity treaties have been negotiated with foreign countries by the State Department since 1898, but all of these have failed of ratification by the Senate, the coordinate treaty-making power. The question as to the right of the treaty-making power to bring about any increase or reduction in the national income by changing the rate of import duty is moot. A number of the best constitutional lawyers in the legislative branch of the government hold that without direct authority from Congress this can not be done. The reciprocity clause of the Dingley Law having had a two years' limitation placed upon it, the position is taken that no authority exists to-day for any reciprocity agreement unless such agreement shall be enacted into law by Congress as a whole.

In the matter of Cuba, deference was paid to this belief and upon the ratification of the treaty it was passed upon by Congress and followed the usual and ordinary course of any other legislative measure. The industrial growth of the United States since the enactment of the McKinley Law is one of the wonders of the world. Economists differ as to the causes of this growth, and attach varying degrees of importance to the fiscal policy under which it has appeared. High protectionists ascribe the increase of national wealth to a protection policy. Others, while admitting that protection has built up many industries, assert that the development of the great natural resources of the United States is solely responsible for the aggregation of wealth presented through the operations of industry in the past 15 years. In fact those who oppose high protection attribute many evils incident to industrial control and monopoly to the immunity from foreign competition afforded by prohibitive tariffs.

There was in the year 1904 a general sentiment throughout the United States in favor of a more or less radical revision of the tariff. Another tariff campaign is not expected, however, for some years, and then many believe that it will come through a wise moderation of its own protective policy by the Republican party. The industrial and commercial interests of the country dread the uncertainty and confusion incident to a tariff revision, ofttimes preferring to labor under an unscientific system of import duties rather than to risk the disturbance of a change and the evils which are possible in a new measure dictated more or less by political rather than by industrial considerations.

One of the great difficulties confronting the framers of a tariff measure for the United States is found in the vast size of the territory involved and the conflict of localized industries. The shoemakers of Massachusetts want hides placed upon the free list, but the Texas cattle man, Democrat as he may be, is in favor of protection for one of his chief products. Hence it is that party lines are not now sharply drawn upon the tariff issue. There are few if any free trade members of Congress. The Democrats as a body are nothing more or less than moderate protectionists, and in their beliefs are not far removed from many of their Republican fellow members, who are almost equally opposed to the extreme high protection ideas which controlled the Republican party in the campaign of 1888. There is no immediate prospect of a radical change in the tariff policy of the United States. Schedules may be lowered or readjusted to meet changing conditions, and some provision may be made in the near future for reciprocity in foreign trade. The principle of protection is too well established in the national policy to be uprooted. See Duty; Free Trade; Imports and Exports, American; Protection; Revenue; Tariff.

James Davenport Whelpley,
Economist.

47. United States — Reciprocity. The term reciprocity, in its economic sense, is not easy to define. The word itself seems simple enough; but it now embraces many things not wholly consistent with its derivation. It has applications in Europe which are unknown in the United States, and it is now used to describe governmental operations to which it was entirely foreign a few years ago. This will account for the inaccuracy and incompleteness of many of the definitions found in the well-known dictionaries and encyclopedias. The writer has examined a number of these attempted definitions, and in nearly all of them it is assumed that a reciprocal trade arrangement involves the grant of identical rights to the citizens of the countries entering into the arrangement; that is to say, that the articles covered by the agreement, and import duties laid under it, must be

the same on both sides. This notion is radically wrong. Reciprocity, as now understood, does not require that the articles named in behalf of one country shall be the same in whole or in part with the articles named in behalf of the other, and it follows, that it does not require that the duties prescribed shall be identical. While in the case of a direct treaty, the thought of equivalency of concession or privilege is not absent, it is a matter of judgment rather than mathematics. For instance, an agreement between the United States and Germany providing that the former should admit to its ports structural iron of German production, upon the payment of an import duty of $5 per ton, and that the latter should admit to its ports wheat produced here upon the payment of an import duty of five cents per bushel, would be reciprocity between the two countries without reference to the value of the bargain to the one or the other.

Some of these definitions are imperfect in another respect. They imply that reciprocity must be embodied in an agreement or arrangement made by treaty between two nations, and which concerns no other countries. This view ignores the well established plan of effecting reciprocity through general legislation or regulation. For instance, the reciprocal relation can as well be created by the means of conditional or maximum and minimum tariffs, as by trade treaties, and Europe affords many illustrations of the use of this plan at the present time.

To three familiar definitions a more particular reference may not be uninstructive. In Lalor's 'Encyclopedia of Political Science,' Vol. III., page 537, the author of the article defines the word as follows:

"Reciprocity is a relation between two independent powers such that the citizens of each are guaranteed certain commercial privileges at the hands of the other."

This definition is much too broad. Reciprocity from the modern standpoint is limited to arrangements respecting tariffs, and much confusion will result if we think of it as including all commercial privileges which may be mutually granted by two sovereignties. Taking the word alone for our guide, it may be fairly correct, for substantially all international agreements have elements of reciprocity, but they are not so denominated, and by common consent reciprocity has become a matter of tariffs.

Another well known encyclopedia ('Chambers,' Vol. III., page 598) defines the word thus:

"A term for an arrangement between two countries having a protective tariff against other countries, to admit each into the other's territories certain specified taxable articles of commerce duty free or with exceptionally light duties. The classes of articles are arranged to balance one another on one side and the other. Such mutual arrangements are sometimes called *fair trade* as opposed to *free trade* and thoroughgoing protection."

This definition is even more inaccurate and misleading than the other. It does not at all follow that articles passing between countries operating under a reciprocal arrangement shall be admitted "duty free" or with "exceptionally light duties," and it is obvious that there may be a reciprocal adjustment in absolute harmony with "thoroughgoing protection." To illustrate: Suppose that the United States imposed a high prohibitive import duty upon foreign glass, and France imposed a high prohibitive duty upon American wheat. A treaty that would admit French glass into the United States so that it could enter our markets upon even terms with our own product, and admit American wheat into the markets of France upon even terms with our competitors there, would embody the policy of reciprocity as now accepted, and yet be absolutely consistent with the strictest theory of protection.

In Harper's 'Encyclopedia of United States History,' Vol. VII., page 383, it is said of reciprocity: "In commercial relations a mutual agreement between nations to secure reciprocal trade, and involving a modification of regular tariff rates." The fault of this description is not only that it implies a specific arrangement and excludes conditional or maximum and minimum tariffs; but that it does not include those cases in which the abolition of discriminating tariffs is a part or the whole of the concession of the one country or the other. It may be, indeed has been, true, that the privilege of enjoying the regular tariff rates constitutes the reciprocal relation existing between two countries.

Without at this time giving attention to the various phases of the word in other countries, its meaning in our own country at the present time may be fairly expressed thus: A direct agreement between two independent countries prescribing the duties which the products, or some of the products, of the one, shall pay upon entering the markets of the other; or, general legislation or executive regulation which makes the duties imposed by one country dependent upon the duties levied in the other. It is important that there should be a careful understanding of the meaning which has gradually been attached to the word, with all its limitations and expansions; otherwise much of the current discussion upon the subject will become unintelligible.

Historical.— Unquestionably the term reciprocity, in its governmental application, was originally used to describe the exchange of privileges in shipping and navigation. But this use long ago became obsolete, and I do not enter upon the development of that part of its history. Confining this article to the United States, except as incidentally there may be mentioned the operation of the doctrine in other countries, it may be remarked that here we have talked and written much about it, but have done very little. To fully appreciate the relation which reciprocity has borne to our tariff laws, it is essential to hold in mind the general attitude of our political parties toward two distinct policies which have, broadly speaking, dominated these laws from the early days of the republic. One party has always stood, with varying degrees of firmness, for the doctrine of protection, which means the levy of import duties upon competitive products sufficient to enable home producers to reach home markets upon at least even terms with their foreign competitors, and the admission of noncompetitive products free, or at most with the lightest practicable revenue duty. Another party has stood, theoretically at least, for a system of duties that would admit competitive products free, or with a light revenue duty, and that would impose on noncompetitive products whatever duty was necessary to provide

the remaining part of the expenses of government which was to be raised through imports. These conflicting economic declarations are in some measure abstract. What has been stated respecting them is a composite of our political platforms, running over many years. In the actual work of the two parties in Congress, marked and constant departures from platform utterances are observable. The party of protection has, especially since 1861, established many duties upon competitive products much higher than necessary to afford protection, and has not always adhered to the principle of admitting noncompetitive products practically free. On the other hand, what may be called the revenue duty party, when in opposition, has spent its time in mere criticism of particular duties, and when in power, has contented itself with formulating tariff schedules which neither answered the demands of its platforms nor afforded adequate protection. It is preferable, however, to judge these parties by their repeated declarations upon policies which they insist should prevail, rather than by congressional enactments or debates. It is obvious that the doctrine of protection presents abundant opportunity for reciprocity in competitive products and but little opportunity for reciprocity in noncompetitive products, unless duties be imposed upon noncompetitive things in violation of the protection theory simply for the purpose of reducing them through reciprocity. It is equally obvious that the doctrine of the revenue duty party presents no opportunity for reciprocity, either in competitive or noncompetitive products; none in competitive products because there is no duty imposed upon them except that which is laid for revenue, and none in noncompetitive products because it would be the climax of folly to impose upon them a single farthing of duties in excess of the requirements of the government. When, therefore, in the 'Congressional Record' it appears that a revenue duty member advocates reciprocity, it will he understood that he is proposing to attach it in some form or other to tariff schedules formed upon the protection plan.

Some of the early general treaties entered into by this country, notably those with France in 1778, with Prussia in 1828, and with Austria in 1829, contained what is known as the "most favored nation" clause, and exemplify the first forms of reciprocity known to our laws; but it is not within the scope of this article to consider their operation. The first substantial effort in this country, looking to practical reciprocity, occurred in 1844 when the President negotiated a treaty with the German Zollverein. It was not ratified by the Senate, its defeat being placed nominally on the ground that the executive had exceeded his authority in negotiating a treaty which infringed upon the rights of the House of Representatives, to which is given, by the Constitution, the exclusive privilege of initiating revenue measures. It is probable, however, that the ostensible objection was not the real one. From the current discussion of the time it is reasonably clear that it failed because many influential senators believed that our duties should be laid by general enactment and should not be created by special agreement with any power. In other words, the opposition was to the whole scheme of reciprocity. Our next venture was more successful. In 1854 we entered into a reciprocal treaty with Canada, which continued in operation until 17 March 1866, when it terminated under a notice authorized by Congress on 16 Jan. 1865. Many controversies had arisen under the treaty and its immediate advantage to the United States was doubtful. Before its abrogation, however, it was made clear that a modified treaty could be secured that would have been of great benefit to our people, both directly and indirectly, but so violent was the spirit exhibited in Congress against its continuance and against any negotiations looking to its modification, that we peremptorily declined to consider the matter with the Canadian authorities. The favorite ground, in speech, for the opposition to the treaty was the fact that during the 11 years, from 1854 to 1865, the balance of trade between the United States and Canada was against us. Viewed, however, in the calmer light of nearly a half century later, and understanding that the value of a treaty with any particular country does not depend upon the balance of trade, it may be assumed at this time with a reasonable degree of certainty, that the real reason for abrogating the treaty and refusing to even consider propositions for its modification and enlargement, was the hostile feeling that the War of 1861–5 had engendered against England and her dependencies, and especially against Canada. We had been sorely tried by the unfriendliness of the British people in an hour of peril, and we were in no fit mind to consider either the commercial or political advantages which might ensue from close business relations with our northern neighbor. Late in 1859 a reciprocal treaty was negotiated with Mexico, but it came into the Senate in the days when the approaching war absorbed the attention of that body to the exclusion of every other thing, and it failed of ratification. A feeble effort toward reciprocity was begun with Hawaii in 1855, but came to nothing. It was revived in 1867, and a reciprocal treaty was negotiated, but it was rejected by the Senate. The subject, however, continued under discussion and a new reciprocal treaty was agreed upon in 1875, which was at once ratified by the Senate and passed into operation. It was renewed with modifications in 1887, and continued until it expired by its terms. In 1883 General Grant and Mr. Trescott, acting for the United States, negotiated with the Republic of Mexico a most important reciprocal treaty. It was transmitted to the Senate by President Arthur with his recommendation. In 1885 the time of ratification was extended one year, and in 1886 again extended for a similar period. This treaty is worthy of especial study, because it initiated what may be termed the modern discussion as to the relation between reciprocity and protection, and is exceedingly significant upon a controversy now widespread — whether reciprocity in competitive things is consistent with the true theory of protection. The Mexican treaty so negotiated by General Grant and Mr. Trescott, if it had been ratified, would have established substantial free trade between the United States and Mexico; and concerning it Mr. Blaine, six years later, wrote thus in a letter to Senator Frye, during the pendency of the McKinley Bill.

"Six years ago the prime minister of Spain, in his anxiety to secure free admission to our markets of the sugar of Cuba and Porto Rico,

agreed to a very extensive treaty of reciprocity with General Foster, then our minister at Madrid. A year before — in 1883 — a very admirable treaty of reciprocity was negotiated by General Grant and Mr. Trescott, as United States Commissioners, with the Republic of Mexico — a treaty well considered in all its parts and all its details — and its results would have proved highly advantageous to both countries. Both these treaties of reciprocity failed to secure the approval of Congress, and failed for the express reason that both provided for the free admission of sugar. Congress would not then allow a single pound of sugar to come in free of duty under any circumstances." While General Grant was negotiating this treaty with Mexico, General Foster, our minister to Spain, was negotiating a treaty with that power covering our business with Cuba and Porto Rico. It also embraced competitive products. It was sent to the Senate by President Arthur near the close of his term, but was withdrawn by President Cleveland, and was not afterward submitted. Contemporaneously with the Mexican and Spanish treaties a somewhat similar one was negotiated with Santo Domingo. Neither of these treaties was ratified for the reason, first, they encountered the opposition of President Cleveland and some of his party, who proposed that all the tariff schedules should be revised in order to bring them to a revenue basis; second, many members of the Republican party stood against them because they interfered to some extent with some of the beneficiaries of the protection policy. The general issue thus drawn at a time when the tariff had again become the paramount question before the American people has continued to this day, and every suggestion toward reciprocity which has since been made has become involved in the division of opinion observed in the discussion of the Mexican and Spanish treaties.

Out of the debates to which reference has already been made there came an act of Congress, providing for a commission for looking into the relations between the United States and the countries of Central and South America, to the end that there might be established more intimacy in a commercial way. This commission visited some of the Central and South American countries, and its reports were transmitted to Congress by President Arthur in 1885. Among other things recommended by the commission was a Pan-American Conference. It was expected that this conference would take into consideration not only the modification of tariffs through reciprocal arrangements, but every other question which related to the development of business between them. Congress authorized the calling of the conference in 1888, and President Cleveland, although hostile to the measure, invited the Central and South American states, together with Mexico, Haiti, and Santo Domingo, to send representatives. The place of meeting was fixed at Washington, and the time, the year 1889. So much President Cleveland did under the imperative command of Congress, but he relaxed nothing of his hostility to the doctrine of reciprocity, which was to be the chief subject of discussion in the conference. In 1889 President Cleveland passed out of office, and President Harrison came in, and Blaine, the keenest-sighted statesman of his age, the ardent friend of protection, but an enthusiastic believer in the efficiency of reciprocity, became secretary of state. It was under his fostering influence that the Pan-American Conference came together, and he was its presiding officer. Its proceedings cannot be followed at this time nor is it possible to point to any specific result of the meeting. It had one consequence, however, which must not be overlooked. It gave great impetus to the investigation of the value of our foreign trade, and to the methods that should be employed for its expansion, but above all, the conference prepared Blaine for the struggle in which he was shortly to engage over the terms of the new tariff law which it was sure the Republican party would shortly undertake to pass. When Congress met in December 1889, the Republicans were in a majority in both branches; and William McKinley, afterward President of the United States, became the chairman of the House committee on ways and means. In April 1890 he reported a tariff bill, which, generally speaking, increased the duties over those of any prior law, and greatly restricted the free list. It was silent with respect to reciprocity in any form, and upon it Blaine fought his campaign for reciprocity. He not only appeared before the committees, but wrote and published letters and made speeches throughout the country, and created, for the first time in the history of the American people, a real interest in the subject. He was measurably successful in the House, continued the struggle before the Senate and with the conference committee, until what is now known as the McKinley Bill became the McKinley Act (q.v.). No attempt will be made to follow this bill in its various stages through the houses of Congress, but it will be interesting to note some incidents which accompanied its passage. In a speech which Mr. Blaine made in his own State, he said, among other things: "I wish to declare the opinion that the United States has reached a point where one of its highest duties is to enlarge the area of its foreign trade. . . . I mean the expansion of trade with countries where we can find profitable exchanges. . . . I think we would be unwisely content if we did not seek to engage in what the younger Pitt so well termed 'annexation of trade.'" . . . In a direct communication to Congress he recommended: "An amendment to the pending tariff bill, authorizing the President to declare the ports of the United States free to all the products of any nation of the American hemisphere upon which no export duties are imposed, whenever and so long as such nation shall admit to its ports, free of all national, provincial, municipal, and other taxes, our flour, corn meal, and other breadstuffs, preserved meats, fish, vegetables, and fruits, cotton-seed oil, rice, and other provisions, including all articles of food, lumber, furniture, and other articles of wood, agricultural implements, machinery, mining, and mechanical machinery, structural steel and iron, steel rails, locomotives, railway cars, or supplies, street cars, and refined petroleum." In a letter written to an influential newspaper shortly after the passage of the bill through the Senate he also said: "Finally, there is one fact that should have great weight, especially with protectionists. Every free trader in the Senate voted against the reciprocity provision. The free-trade papers throughout the country are showing determined hostility. . . . They know and feel that with a system of reciprocity established and growing their policy of free trade

receives a most severe blow. The protectionist who opposes reciprocity in the form in which it is now submitted knocks away one of the strongest supports of the system. The enactment of reciprocity is the safeguard of protection. The defeat of reciprocity is the opportunity of free trade." Shortly after the bill appeared in the Senate, Senator Hale, a prominent Republican, introduced an amendment to it which embodied in terms the recommendation that Mr. Blaine had made, and which has already been quoted. About the same time, Senator Sherman, a long-time leader of the party of protection, offered an amendment which provided, first: a reciprocal arrangement with Canada for the free admission of coal into both countries; and, second: for a joint commission to negotiate a full reciprocity treaty with Canada. Both these amendments failed, but they are important in that they mark the division in the ranks of the Republican party concerning reciprocity — a division which was then somewhat vague, but which has now become sharp and clear, and which involves the fate of reciprocity as an efficient economic doctrine in the United States.

The McKinley Bill as it finally passed contained an effective provision for reciprocity in both competitive and noncompetitive things, namely: Under the act generally sugar, molasses, coffee, tea, and hides were admitted free of duty. The President was authorized to put them upon a dutiable list if any country sending them here failed to treat our exports fairly. It is therefore clear that whatever Congress may have thought of the practicability of a treaty of reciprocity with Canada or with the countries of Europe in competitive things, it firmly established the doctrine that it was wise in some instances and with some countries, to enlarge our foreign trade by making agreements that would admit competitive products into our markets. Mr. Blaine, who firmly believed in the great advantages that might be acquired for his country, at once went energetically forward, with the result that in the course of a little more than a year we entered into reciprocal treaties with Brazil, with Spain for Cuba and Porto Rico, with England on behalf of Jamaica, Trinidad, Barbados, Guiana, and the Leeward and Windward Islands, with Santo Domingo, Guatemala, Salvador, Costa Rica, Honduras, and Nicaragua in the American continent, and with Germany and Austria-Hungary in Europe.

In 1892 the Democratic party was again successful, and on 4 March 1893 President Cleveland again became President. When Congress met in December, 1893, both branches were Democratic, and under the leadership of William L. Wilson, chairman of the House committee on ways and means, work was immediately begun upon a tariff bill which would embody, it was hoped, the Democratic revenue duty view. The presence of Democratic protectionists in the Senate prevented the passage of the measure as it came from the House, and as finally passed it was a conglomerate of protection and free trade; but without any provision looking toward reciprocal arrangements with other countries; not only so, but it abrogated every treaty that had been entered into under the McKinley Act. We were thus left, in 1894, with not a single reciprocity treaty in existence, unless an exception be made of the rather uncertain relations that then existed between this country and Hawaii, and from that time until 1897 there was no effort made to establish reciprocal relations with any country in the world. In 1896 political supremacy again shifted, and William McKinley was elected President of the United States, and with him came in a Republican Congress. A special session was immediately called, and Nelson Dingley, chairman of the ways and means committee of the House, within a few days after the session opened, presented a tariff measure, formed along protection lines. The chief discussion of the bill, both in the House and Senate, related to reciprocity. This discussion developed the usual difference in the dominant party. As adopted, the Dingley Act conferred upon the President the absolute right to enter into reciprocal arrangements with any country permitting free importation, in consideration of satisfactory concessions to us, of the following articles: argols or crude tartar or wine lees, crude brandies or other spirits manufactured or distilled from grain or other materials, champagne and all other sparkling wines, still wines and vermuth, paintings and statuary. It will be observed that these are all competitive products, but they are not of the first importance in the commerce of the country. It further gave the President power to suspend the free importation of coffee, tea, tonquin, tonqua, or tonka beans, and vanilla beans from any country that imposed duties upon our agricultural or manufactured products which, in the opinion of the President, were reciprocally unequal and unreasonable. It further gave to the President, for the purpose of securing reciprocal trade with foreign countries, power to enter into treaties, by and with the advice and consent of the Senate, and the approval of Congress, covering all products, for a period not exceeding five years, and to attain that end permitted the reduction of duties imposed by the Dingley Act to the extent of not more than 20 per cent. Whatever else may be said of the Dingley Act, it must be admitted that it contains a full and complete recognition of the advantages of reciprocal treaties embracing all products, competitive as well as noncompetitive. It has often been said that many of the duties were fixed at a high point in order to give room for reduction through reciprocity. It is not, and cannot be, known certainly whether this be true or false, but theoretically it must be assumed that the duties were fixed at the protection point, and that the latitude of 20 per cent was intended to admit some things into our markets that would come into competition with our own products. The difference between approving any particular treaty and establishing a policy must not be forgotten. It is to be presumed that the executive would not negotiate nor Congress approve a treaty that upon the whole would injuriously affect the general welfare of the people of this country, but upon the controversy respecting the scope of reciprocity as a political or economic doctrine the Dingley Act is conclusive. It may very well be that some of the members of Congress believed that they were keeping the promise to the ear and breaking it to the hope and that they anticipated the refusal of both the Senate and the House to even consider treaties that might be negotiated under the act to which they gave their support. If this be true,

it merely proves double dealing and insincerity, but it does not impeach the general conclusion.

President McKinley, proceeding upon the hypothesis that the Dingley Act meant what it said, immediately appointed John A. Kasson, a distinguished statesman and diplomat, to conduct negotiations for the state department, looking to reciprocal treaties which would carry out the purposes of the act, and in the years 1899 and 1900, he, on behalf of the United States, signed treaties with France; with Great Britain for Jamaica, Turks, and Caicos Islands, Barbados, Bermuda, and British Guiana; with Denmark for the Danish West Indies, including the Dominican Republic, with Nicaragua, Ecuador, and Argentina. These treaties were all transmitted to the Senate by President McKinley, with his recommendation for their ratification, and there they have ever since remained without action either favorable or unfavorable. In 1903 we entered into a reciprocal treaty with the Republic of Cuba. It was not brought about, however, so much by commercial considerations as by a desire to satisfy obligations of honor created at the time Cuba accepted certain amendments to her constitution proposed by the United States. Attended even by these circumstances, it required all the influence that the executive could bring to bear upon Congress to secure a ratification of the arrangement. This treaty provided, among other things, for the introduction of Cuban sugar at a reduced duty, and sugar being a sharply competitive product, the old dispute was renewed. In 1898, under the concurrent action of the United States and Canada, a Joint High Commission was created for the purpose of reviving, if possible, reciprocity between these countries. The commission held many and long continued conferences, but no agreement was reached. It is still nominally in existence; but there seems to be no disposition on either side to resume its labors.

The foregoing is a bare outline of the history of reciprocity in the United States. After all that has been said and done, the only evidence of progress toward the expansion of our foreign trade through reciprocity that we have preserved is the treaty with Cuba. Our exports are large, but they have grown to their present immense proportions without the aid of the government, and indeed in spite of its influence.

Conclusion.— Whether reciprocity will become an active factor in our industrial life depends upon two contingencies. If the revenue duty party now known as the Democratic party secures and retains control of the government, reciprocity is eliminated as an economic force in our affairs, for even though in revising the tariff it does not embody the theories of its platform utterances, it will adhere to its legislative view of a general, unconditional, inflexible reduction of duties. If the protection party, now known as the Republican party, maintains its supremacy, and that element in it which insists upon the absolute exclusion at all times and under all circumstances of all competitive imports from our markets, shall prevail, reciprocity falls into a mere abstraction. If, however, that element in it which has adopted the opinions of Garfield, of Blaine, of Sherman, and of McKinley, in his later years, shall prevail, then our foreign trade, which must always be small as compared with our domestic trade, but which nevertheless is essential to our steady progress and permanent prosperity, will receive its due share of the care and solicitude of our statesmen and law makers. See FREE TRADE; PROTECTION.

ALBERT B. CUMMINS,
Governor of Iowa.

48. United States — Development of the America Idea or Democratic Spirit in the. The United States is spoken of rightly by all writers as the living exponent of the democratic idea in government. Carlyle in a celebrated epigram spoke of democracy as starting from Bunker Hill to make its journey round the world. And while the leading writers of the civilized world recognize this statement as condensing the true history of the progress of the democratic idea, the existing constitutions and governments of the United States itself present themselves as the physical creations of a Democracy. It is, therefore, interesting to remember that among all the settlers of English or French blood who founded the Thirteen United States of 1775, no man had any forelook to a government of pure democracy. That is to say, the idea of universal suffrage as a controlling power in the state, did not suggest itself to any one of the founders of America. What is more, very little discussion of universal suffrage will be found even in the best writers from time to time. When Topsy said of herself, "I 'spects I growed," she announced without knowing it the law of existence of universal suffrage in America. There are illustrations even humorous in the early history which show the surprise which existed among the first founders when the equality of men began to assert itself. Thus in the Massachusetts annals we find Winthrop, the first governor, thought he was to be attended by four men with halberds. When the Court of Assistants would not vote him the halberds, Winthrop made four of his own servants carry them. But Winthrop very soon found that he was servant and not master. The halberds were relegated to the museums,— one might say in half an hour. What does this mean? It means that so soon as they were building log cabins, one man who could swing an axe was in as much demand as another. If the churl could lift one end of the log as well as his master who was at the other, the sentiment of equality was at once implied. In Knickerbocker's 'History of New York' you find a similar instance as funny as this, which we owe partly to Irving's wit and partly to the real annals of the infant town. Writers on the subject like to refer this opinion of equality to the customs of the German forests. It is probable that in fact like causes produced like effects. In the German forests or in the forests of Massachusetts Bay, or on the Blue Ridge or in the Valley of the Mohawk, the new settler found that he was the essential part. Land as land proved to be worth nothing. Land proved to be valuable only in proportion to the number of men who lived on it or wanted it. This discovery that land as such is worth no more than water as such, that an acre of land is as worthless as an acre of salt water in the Atlantic, was the first discovery of the new settlers.

In most of the modern colonies of the world the results of this discovery were slightly affected by the arrival, with the settlers, of governors who brought with them feudal notions

and commissions and exercised as such feudal powers. But the efforts for such English domination here were ludicrously small. The Colony of Massachusetts at the beginning, took care to have no relations whatever with the crown. From the beginning till Charles I. fell, there will not be found a document of the slightest importance addressed by the independent states of Massachusetts Bay to any secretary of the king or the Parliament. On the other hand, it proved very early in their affairs, that they would not display the flag of England on their fort when they were asked to do so by an officer in King Charles' navy. When they found themselves threatened by that navy, they considered first the means of fortifying Boston that they might keep out the invasion of their own "sovereign"; and, second, they discussed the best methods of removing to the Valley of the Mohawk, into a sealed wilderness where no Stuart should dare to come. Something similar to this could be said of Virginia. It may be doubted whether an ounce of powder or lead from the royal stores was ever furnished for that colony. Nothing is more certain than that William Penn, in the colony which established Pennsylvania, received no help from the crown. "Nourished by your care?" — these are the words ascribed to James Otis — "It was your oppression that drove us to America. Our fathers plunged into the ocean, with the charter of freedom in their teeth, and left the faggot and the sword behind them."

It was true that under the several charters, some broken-winded soldier or some penniless courtier was sent over from time to time to be what was called "Governor of Virginia," "Governor of New York," "Governor of New England." But how did the poor creatures govern? How did they get the daily bread for their wives and little ones, or the butter for the bread? It was they who were dependent on the colonies, not the colonies who were dependent on them! Poor Lord Bellomont, governor of all New England and New York under Queen Anne, was walking home one day from the Puritan Thursday Lecture in Boston. The poor man had to hear it once a week, lest he should offend the General Court of the Province of Massachusetts, who voted him his annual salary. As the governor's cortége passed an apothecary's shop in the Main Street, his excellency said to the shop-keeper, who was lounging at the door, "You have lost a precious sermon, doctor." "I would have heard it," said the impudent apothecary, "if I had been paid for it as well as your lordship was." That is the way in which, under such auspices, an apothecary speaks to the representative of Queen Anne. And the governor cannot help himself, because what the apothecary says is founded on the truth. The crown is dependent on the colony. The colony is independent of the crown. Earlier than this, in the reign of Charles II., the combination of all the savages of New England had threatened the four colonies there with extermination. One in eleven of all their men was killed in war. More than that number carried the wounds of battle to their graves. Nearly half their towns were raided by the savages. It was a question, close to every man's thought, whether they should not be all swept into the sea. So near was the exigency to one which should leave the colony of New England to be marked only by such traces as we find to-day of the Norse colony on the coast of Greenland. When it was all over, and peace re-established, their friends in England asked them why they had not sent for help. In fact, they had not sent for soldiers, for lead, or for powder. The answer was very simple. They had no concern with Charles II., beyond sending him now and then a complimentary present of a barrel of cranberries to flavor his Christmas dinner; or perhaps a cargo of spars, to show him what they could sell him for his navy. As for the savages, that is our affair — it is none of his. We coin our own money. We fight our own enemies. "We are and of right ought to be independent states."

It will be found, however, in the gradual growth of the thirteen original colonies that this equality of the citizens presupposed, almost without the asking of a question, the citizen's ownership in land. The suffrage up to the Revolution was almost entirely a suffrage of landed proprietors. The precise solution of difficulties which always occur now to Girondists and other theorists, had asserted itself already. Let the man own land so that he shall have some stock in the commonwealth. As a matter of theory the custom prevailed in many of the colonies that no person was admitted to the suffrage except by the vote of those who had it already. Practically this came out in the presentation every year at the annual election of a list of tax payers. These tax payers were, as a matter of course, voted in as freemen. The one great exception always mentioned by American writers on the subject is that made by the Puritan States of New England, who for a generation refused to admit as voters any men who were not members of their Congregational Church. But this distinction also gave way under pressure of an intimation from Charles II., made in his letter to the colony of 28 June 1661. "Since the principle and foundation of the Massachusetts Charter was and is the freedom and liberty of conscience, we do hereby charge and require you that that freedom and liberty be duly admitted and allowed. . . and that all persons of good and honest lives and conversation be admitted to the sacrament of the Lord's Supper . . . we assuring ourselves and obliging and commanding all persons concerned that in the election of the governor or assistants, there be only consideration of the wisdom and integrity of the persons to be chosen, and not of any faction with reference to their opinion or profession, and that all the freeholders of competent estates not vicious in conversation, orthodox in religion, though of different persuasion concerning church government, may have their vote in the election of all officers, civil or military."

One may say in a parenthesis that King Charles would have found it hard to make himself a voter under these conditions. The reader will observe, however, that in this enlargement of the suffrage of Massachusetts, it was only the freeholders for whom the privilege of the ballot is required.

As late as 1789, in Franklin's discussion of the Constitution of Pennsylvania it appears

that the proposal had been made that an "Upper House" should be chosen by freemen possessing in land and house £1,000. The "Lower" body was to be chosen by such as had resided four years in the country and paid taxes. Franklin protests against this because it gives "the rich predominancy in government, a choice peculiar to themselves in one half the legislature, to be proudly called the 'Upper House,' and the other branch, chosen by the majority of the people, degraded by the denomination of the 'Lower'; and giving to this Upper House the permanency of four years and but two to the Lower." Against this Franklin protests, but at that time he probably thought that a freeman who paid taxes would be a landholder, as he probably was 99 cases out of a hundred. However this may be, it is certain historically, that with the creation of an army in which every man was obliged to serve, every such man would in the end be permitted to vote. The State of Massachusetts, for instance, in 1777 swept every boy and man in the Valley of the Connecticut between the ages of 15 and 55 into its militia and sent that militia to fight against Burgoyne. The crops of the Connecticut Valley that year were harvested by women. Now it was very hard to tell those men when they came back that unless they held land or property they would not be permitted to have a share in the government. The first concession apparent which was made to the great demand for universal suffrage was that the property on which taxes were to be paid was eventually not necessary in land. Thus the Constitution of Massachusetts, adopted in 1780, required that a voter should have an estate of the value of £60. This was removed by the amendment introduced in 1820. It is with reference to some such provision as this in Pennsylvania that Franklin made his suggestion regarding the death of an ass. He supposed a voter who owned an ass which earned for him £3 a year, riding to the voting place on this ass. The ass falls and dies on the way to the election, and the voter loses his vote. Franklin asks with his pitiless humor whether in that case it is the ass who votes or the man.

In the establishment of the western States of the Valley of the Mississippi there appeared very soon the wish on the part of those who in any State made its constitution to recommend the new-born State to emigrants, whether from the Atlantic sea-board or from Europe. This wish dictated the widest extension of the suffrage which could be granted. Now the Constitution of the United States gives to each State the power to choose the members of the National House of Representatives who are to be elected by the same constituency which chooses the popular branch of the State legislature. Any State, therefore, by its terms of suffrage for its own house of representatives, virtually gives suffrage in the National Legislature. This results in universal suffrage.

Universal suffrage was not proclaimed, as theorists would suppose, by any sudden revelation of sentiment or of authority. It came about almost without man's knowledge. In fact, at this hour, in most of the northern States where property is much subdivided, it would prove that there are as many persons who pay taxes on property in the State as there are voters at the average election. They are not precisely the same people. Women may be tax payers who do not vote, or unnaturalized aliens may be tax payers who do not vote. But the small margin of such people is really unimportant. In practice it would be fair to say that the suffrage is universal suffrage for men.

It is easy then to see that the result of elections in the long run will be the choosing of men or of laws which are acceptable to the average of the people. If by whatever processes, call them human or call them divine as one will, the average of the people prefer right to wrong, good to evil, law to license, universal suffrage will give them what they want. Universal suffrage does not profess to obtain the elegant niceties of the theorists, but it is apt to prefer sense to nonsense, government to anarchy, national honor to national dishonor. The result hoped for and thus far attained in the American democracies will depend, as our people are always saying, upon education. If more than half your people want to have a good road rather than a bad road, an upright court rather than a corrupt court, if they prefer good schools to bad schools, universal suffrage will give such privileges to them in the long run. For this, what is called the higher education of the majority of the people is well nigh necessary. You do not make an intelligent voter by teaching him to write his name, to read his Bible, or by teaching him that 9 times 9 is 81. But when you extend your public education from bald instruction in facts so that it shall involve some knowledge of history, some outlook into the larger range of government and some reverence for law, the decision of universal suffrage may be safely relied upon. At the beginning of the Civil War Abraham Lincoln said boldly in his first message: "There are many single regiments (in the army) whose members one and another, possess full practical knowledge of all the arts, sciences, professions, and whatever else, whether useful or elegant, is known in the world and there is scarcely one from which there could not be selected a President, a Cabinet, a Congress, and perhaps a court, competent to administer the government itself. Nor do I say this is not true also in the army of our late friends, now adversaries in this contest."

What he said was true. And wherever that can be said, the country in which it is said need not be afraid of the decisions of its democracy. It will be observed, however, that in order to preserve such success, the higher education of the country,— what the French call oddly enough its secondary education, must be kept at that level which shall enable us to say that the decisions of the average of the people may be sufficient for the administration of law.

EDWARD EVERETT HALE,
Author of 'The Man Without a Country.'

49. United States — Civil and Religious Liberty in the. The euphony and familiarity of this title must be broken so as to read, "Religious and Civil Liberty in America," if we are to study the subject in its logical as well as its chronological order, for civil liberty follows and is the product of religious liberty. A hierarchy implies an aristocracy; an aristocracy a monarchy. The student can do no better than to group his studies around the names of Roger Williams (q.v.) and Thomas Jefferson

(q.v.). The birth of the one preceded that of the other by 136 years. The pivotal date of the first is the founding of the Providence Plantation by the exiled Roger Williams, 1636; and the pivotal date of the other is the signing of the Declaration of Independence in 1776. These two events are separated by a period of 140 years. The story of these two men is told elsewhere in these volumes, but the story of civil and religious liberty in America cannot be separated from their lives; still less can its purchase price be understood or appreciated apart from their story. Says John Fiske:

> Within five years from the settlement of Massachusetts this young preacher — the learned, quick-witted, pugnacious Welshman, Roger Williams, had announced the true principles of religious liberty with a clearness of insight quite remarkable in that age.

There is good history back of the pleasantry that the Puritans sought the western shore in order that they might enjoy the privilege of worshiping God according to the dictates of their own conscience and the further privilege of making all others worship in the same way. Governor Winthrop, one of the most liberal of the Boston Colony, wrote:

> We believe it to be important that the members of a Christian commonwealth should all hold the same opinions regarding essentials; and of course it is for us to determine what is essential. If people who have come here with us hold different views, they have made a great mistake and had better go back to England. But if, holding different views, they still wish to remain in America, let them leave us in peace and, going elsewhere, found communities according to their conscience of what is best. We do not wish to quarrel with them, but we will tell them plainly that they cannot stay here.

This is literally the program carried out in the case of Roger Williams. From the beginning he denied the power of civil magistrates to punish for violations of "the first tablet of the law," the table of piety, dealing with man's relations to his God. He declined the call to enter upon his chosen work with the settlement on Massachusetts Bay because they were not "separated," as the Pilgrims were who settled at Plymouth; they were simply non-conforming members of the Episcopal Church, and as such they claimed the right to discipline for spiritual as well as civic misdemeanors. A few months later he accepted the opportunity to work with and for the Pilgrim Fathers of Plymouth Here he worked for two years, supporting himself by manual toil during the week and teaching on Sunday. But his ecclesiastical independence and his persistent teaching of the principles of soul-liberty filled Elder Brewster with anxiety, and when a call was given the young radical from the Salem church, the good Elder advised the Plymouth church to demit him. In the latter controversy, John Cotton, the belligerent ecclesiastic of Boston, remembered that "Elder Brewster warned the whole church of the danger of his spirit."

When in 1633 the young minister ventured again within the jurisdiction of the Bay and took up the work of a religious teacher at Salem, the Boston ministers protested and objected to his coming among them at the ministers' meetings held from house to house. Two years later he was summoned to Boston to answer charges before the General Court. He was accused of teaching that magistrates ought not to punish a breach of the "first table" except when it was also a disturbance of the civil peace; that the church had no right to impose an oath on an unbeliever, and that prayer at the sacrament or after meat must not be enforced by the magistrates. Williams' defence was that "none of his teachings led to a breach of holy or civil peace, of which I have desired to be unfeignedly tender." Governor Winthrop, of whom Williams wrote years afterwards, "Though he was carried with the stream for my punishment, he tenderly loved me to his last breath," recorded in his diary:

> Rev. Mr. Hooker, who was chosen to dispute with him, could not reduce him from any of his errors, so the next morning the Court sentenced him to depart out of our jurisdiction within six weeks, all the ministers save one approving the sentence.

The sentence itself in part runs as follows:

> It is therefore ordered that the said Mister Williams shall depart out of this jurisdiction within six weeks now next ensuing, which, if he neglects to perform, it shall be lawful for the Governor and two of the magistrates to send him to some place out of this jurisdiction, not to return any more without license from the Court.

But soon this six weeks' leniency caused the magistrates anxiety; they were afraid he would be able to carry out his expressed purpose of "establishing an independent community where all men may work as their conscience persuades them, everyone in the name of God." A captain of a sloop was therefore sent with orders to apprehend Williams and carry him on board his ship about to sail for England. The captain found the wife and children, but the minister had departed three days before. Thus in midwinter, January 1636, this earliest apostle of religious liberty in America, and, up to this date, one of the very few such apostles in the history of the world, secretly departed from Salem, leaving wife and children behind him. He sailed away, according to the advice of Governor Winthrop who, apparently ashamed of the precipitancy and narrowness of his clerical colleague, had advised Mr. Williams to retire promptly to the Indians on Narragansett Bay, where he would be beyond English claims and patents. His own account of this momentous exodus in America runs in part as follows:

> I steered my course from Salem — though in winter snow, which I feel yet — unto these parts wherein I may say *Peniel*, that is, I have seen the face of God. I first pitched, and then began to build and plant at Seekonk, now Rehoboth; but when I received a letter from my ancient friend, Mr. Winslow, then governor of Plymouth, professing his own and others' love and respect to me, yet lovingly advising me, since I was fallen into the edge of their bounds, and they were loth to displease the Bay, to remove but to the other side of the water; and then he said I had the country free before me, and might be as free as themselves, and we should be loving neighbors together. These were the joint understandings of these two wise and eminently Christian governors, and others, in their day, together with their counsel and advice as to the freedom and vacancy of this place, which in this respect and many other providences of the Most Holy and Wise One, I called Providence.

Following the voyage came the desperate exposures on land,—"fourteen weeks of bitter winter season without knowing what bread or bed did mean," in his own phrase. His only succor was received at the hands of the Indians, whose language he had mastered during his Plymouth ministry for a purpose higher than he could then have dreamed of. When the final place of settlement was reached on Rhode Island, he said: "In gratitude to God's merciful providence to me in my distress, I gave to the place the name of Providence."

Henceforth the story of Roger Williams is the story of the planting of what is probably

the first commonwealth in history into whose fundamental constitution was incorporated an unequivocal guarantee of religious liberty. From Constantine to Williams, the Christian church, always and everywhere in Christendom, dominated the State. Indeed, in all religions and in all ages, up to this time, priests have more or less directly claimed to be the arbiters of the civic and physical interests as well as of the spiritual destinies of men. The quality and quantity of the work accomplished by Roger Williams cannot be appreciated until the spirit of the Puritans, of whom he was one and with whom he contended, is more closely studied and understood. Popular traditions have lumped the various settlements of New England under one estimate, as one movement. The Puritans have been studied too much in bulk, as though they represented a coherent and consistent body, moving forward with one spirit and for one end: that spirit the spirit of freedom, and the one end religious and civil liberty. But the banishment of Roger Williams is but one of a series, albeit the first of such acts. The noble Henry Vane arrived in Boston three months before Williams had to flee. Though a young man of only 24 years, he was of such brilliant powers that he was made governor of Massachusetts. But the spirit of the people was too intolerant, the air too dogmatic for him to stay, and in less than three years he went back to England to his larger career and to a tragic death for freedom's sake. In 1636 came Anne Hutchinson, the brilliant woman who preached transcendentalism before the Transcendentalists: a woman who was gladly heard in the pulpit at that early date; she gathered around her a growing following,—but she must not stay. With her band of followers she had to go. They turned their faces toward the land of greater freedom, the hospitable Rhode Island, where for a while she tarried on her way to death from an Indian's tomahawk, in the neighborhood of what was to be New York.

The persecuted Quakers were naturally drawn to the boasted freedom of the New World, but when Anne Austin and Mary Fisher, representatives of this fellowship, landed at Boston from Barbados in 1656, they were promptly locked in jail lest they might proclaim their heresies to the curious crowd that gathered around them. A council pronounced their doctrines blasphemous; their books were burned, and they themselves confined under hard circumstances for five months, until the ship they had come in was ready to return them to Barbados. Later these Quaker missionaries found a more cordial welcome at the hands of the Mohammedans in Turkey than they did at the hands of the Christian Puritans in Massachusetts. However, the contention of John Fiske, that the Puritans had more at stake than the Mohammedans, deserves to be considered in this connection. Following these two women came eight Quakers from London, who were promptly arrested and special laws were passed that they might be disposed of. The penalties affixed in these anti-Quaker laws were cumulative, passing on up from flogging, through imprisonment at hard labor, cutting off one or both ears, boring the tongue with a hot iron, until finally capital punishment was reached in 1659, when two were hanged on Boston Commons. This was going farther than Quaker persecution had ever reached in old England; and next year a Quaker woman was hanged at the same place. The last victim suffered in 1661, for the sole crime of holding to and practicing the precepts of George Fox, as represented by the fellowship of the Friends.

There is no finer test of a man's sincerity than that which demands that he take his own medicine. Roger Williams was called upon to apply his own doctrines in the case of the Quakers. From their teachings he dissented most heartily; he never came so near the intolerant spirit as in the book entitled 'George Fox Digg'd out of his Burrowes,' and George Fox never came so near dealing in venom as in his reply, entitled 'A New England Fire-Brand Quenched.' And still the communities of Rhode Island not only refused to join with the New England confederacy in a movement to keep out the Quakers, but welcomed them in spite of their views. When George Fox visited this country he did not dare go farther north than Newport, R. I., where he was sheltered in spite of his teaching. Hither Williams went, thirty miles in an open boat, he himself working the oars, not to suppress, but to hold high debate with the great disciple of soul-liberty, who had stood the test in England even as Roger Williams had in America, and who, in his doctrine of the "inner light" and the noncombatant requirement of religion had found a more ample foundation for religious liberty than the probably less heterodox opinions of Williams.

As with the followers of Anne Hutchinson and George Fox, so with the Jews. Williams pleaded their cause with the powers of England, and the hunted children of Israel found shelter and welcome at Newport, where the lonely graves of the exiled community moved Longfellow two centuries later to sing the pathetic song of toleration entitled "The Jewish Cemetery at Newport."

Twice, at least, Roger Williams returned to England in the interest of the new community, each time for the sake of strengthening the safeguards of religious liberty in his charter rights. The first time he was obliged to sail from Manhattan, for he was an exile from Boston. Once his stay was prolonged for three years, during which time he was deep in the politics of the Protectorate, an active helper of Cromwell, and an intimate associate of Cromwell's foreign secretary, "Mister Milton," to whom he taught Dutch. Scant justice has as yet been done to the benignant and ameliorating element introduced into the history of the United States, particularly of the New England States, by Roger Williams. He came to reform the reformers, of whom Hawthorne facetiously said:

> Let us thank God for having given us such ancestors; and let each successive generation thank Him not less fervently for being one step further from them in the march of ages.

Williams necessarily had much fighting to do. The titles of his books suggest controversy. "The Bloudy Tenantt of Persecution for Cause of Conscience; A Dialogue Between Truth and Peace," is his most noted work. This a Puritan House of Commons caused to be burned in England. To this John Cotton wrote the reply entitled, "Bloudy Tenantt Washed and Made White in the Bloud of the Lamb." In due time

came the rejoinder from Williams, "The Bloudy Tenantt Yet More Bloudy by Mr. Cotton's Attempt to Wash it White in the Bloud of the Lamb." But notwithstanding this belligerency, Williams vindicated the liberty he espoused, and demonstrated in his own life that liberty and the love of liberty breed tenderness and not violence. "We have taxed your patience often, but never exhausted it," wrote Governor Winthrop. And his latest biographer, Oscar S. Straus, says: "In no act of his life is a spirit of selfishness disclosed"; and again, "His patriotism was never dimmed by a shadow of suspicion of self-interest"; and again, "He held his colony with a firm hand and a wise head." He ever preferred to be the power behind the throne rather than to be the power on the throne. When the Indians were at last nagged into the violence that led to the invasion of Rhode Island, Roger Williams, unarmed save with his staff, went out to meet them. He failed to turn them back, but they said, "We will not hurt you, Brother Williams." This accomplished linguist, the master of seven languages, spent his 70 years and more in unceasing toil, much of the time earning his bread by manual labor. He alludes to a sacrifice of his own interests by refusing to kiss the Bible when taking an oath in England, but furnishes no particulars. Everywhere and always he kindled the spirit of liberty, and was never known to light the fires of persecution.

The first compact of the little band of exiles on the hill he named "Providence" carried the signatures of 13 men, five of whom made their mark. It was of such humble material that he laid the foundations of the first State ever unequivocally committed to religious liberty. His first-born son is supposed to have been the first white child in Rhode Island. The last charter he obtained from Charles II. was so wisely drawn, and liberty in it was so securely vouchsafed, that it served the commonwealth of Rhode Island for one hundred and eighty years; it was not changed until 1843, and it would still serve as a model for a new State.

Thus the movement for religious liberty in America unfolded naturally into a passion for democracy, a demand for civil liberty, and our study lands us at the feet of Thomas Jefferson, who was the father of civil liberty in America, so far as movements whose beginnings are always hid in the obscurity of still more primitive beginnings can be said to have a father.

"*Author of the Declaration of Independence, of the statute of Virginia for religious freedom, and Father of the University of Virginia,*" was the inscription which Thomas Jefferson left among his papers as one suitable for his own tomb. In another catalogue of things accomplished, drawn up by his own hand, we find the following: "Separated the church and state in Virginia; put an end to entails; prohibited the importation of slaves, and drafted the Declaration of Independence."

Mr. Jefferson was the widest read, the most accomplished of the presidents, the intellectual giant of them all; the first, if not the greatest, thorough-going democrat in American politics. Jefferson, Jackson and Lincoln are the three presidents who, in practice as well as in theory, by nature as well as by conviction, believed so profoundly in popular government and the simplicity and freedom involved therein that it became to them a religion, a source of unfailing enthusiasm. These three belonged to the people, and found their highest inspiration in the purpose to serve them. The opinions of no other president ever received such prompt respect at home and abroad as those of Thomas Jefferson, and his official utterances occupy a place in literature as well as in the history of statesmanship unparalleled by the deliverances of any other president of the United States, save Lincoln.

Jefferson's devotion to civil liberty led to, or sprang from, his freedom in religious thought, in which he was notoriously unorthodox. He was deeply versed in the writings of French philosophers and the events that led up to the Revolution, and was sufficiently grounded in the philosophy of liberty to be able to give at short range the true estimate of that atmosphere-clearing storm which all clear thinkers at longer range are able to give it. He was a confidant and friend of Thomas Paine, and the principles laid down in "The Rights of Man" and "Common Sense" were not only familiar but congenial to him and probably had a direct influence upon his work. These documents, together with the life of the much-maligned and cruelly misunderstood author, should be closely studied in connection with the subject at hand.

At the first Congress, systematically convened in Philadelphia in 1774, Thomas Jefferson was chairman of the committee appointed to draft the Declaration of Independence, which in due time was offered in his own handwriting, essentially as it now stands; a clause censuring slave trade was suppressed. He regretted the first draft of the Constitution as adopted because he feared the liberties of the citizens were not sufficiently safeguarded; it contained no precaution against monopolies and standing armies; the freedom of conscience and of religion were not sufficiently guaranteed; the rights of habeas corpus were not adequately secured, and no limitation was set to the time one person could occupy the presidency, which, unguarded, as he feared, might grow into an absolutism more or less complete; in short, because it had no "Bill of Rights." Says one of his later biographers:

> In his day, Mr. Jefferson combated a greater number of laws which were oppressive, customs which were stale, tendencies which were undemocratic, and fixed opinions which were popular than any other man in public life. He attacked systems and creeds where they were most sensitive. He aroused vested interests which were the most powerful, and which, when alarmed, were the most vindictive. Yet never once in all his long life did he falter, surrender, or apostatize.
>
> He took the unpopular side of slavery, and held to it. He defied the religious bigotry of his times, and continued to defy it. He challenged the organized power of land monopoly and class rule in his own State and overthrew it.

The first session of Congress after the adoption of the Constitution in 1789 adopted 12 amendments, most of them looking towards the relieving of the above anxieties expressed by Mr. Jefferson; the first amendment providing for the religious freedom of all the citizens, and the unequivocal separation of church and state. The constitution of nearly every state in the Union now has its "Bill of Rights." Most of these bills incorporate the exact phraseology of the Declaration of Independence concerning the "inalienable rights to life and liberty, and the pursuit of happiness." This guarantee of re-

ligious liberty is somewhat modified by the following States:

Maryland declares a person incompetent as a witness or juror who does not believe

in the existence of God, and that under His dispensation such person will be held morally accountable for his acts, and be rewarded or punished therefor in this world or the world to come.

The law of Maryland provides that "a belief in the existence of God" is a necessary qualification "for any office of profit or trust in this State." And also:

That every gift, sale or devise of land to any minister, public teacher, or preacher of the gospel, as such, or to any religious sect, order or denomination, or to or for the support, use, or benefit of, or in trust for, any minister, public teacher, or preacher of the gospel, as such, or any religious sect, order, or denomination; and every gift or sale of goods, or chattels, to go in succession, or to take place after the death of the seller or donor, to or for such support, use or benefit; and also every devise of goods or chattels to or for the support, use or benefit of any minister, public teacher or preacher of the gospel, as such, or any religious sect, order or denomination, without the prior or subsequent sanction of the Legislature, shall be void; except always, any sale, gift, lease or devise of any quantity of land, not exceeding five acres, for a church, meeting house, or other house of worship, a parsonage, or burying ground, which shall be improved, enjoyed, or used only for such purpose; or such sale, gift, lease, or devise shall be void.

Mississippi provides that "The Holy Bible shall not be excluded from use in any public school of this State"; and makes a six months' residence a sufficient qualification for voting to a minister of the gospel, while two years' residence is required for a layman.

New Hampshire provides that:

The people of this State have a right to empower, and do hereby fully empower the Legislature to authorize, from time to time, the religious societies within this State to make adequate provision at their own expense, for the support and maintenance of public Protestant preachers of piety, religion, and morality; provided, notwithstanding, that the several towns, parishes, bodies corporate, or several religious societies shall at all times have the exclusive right of electing their own public teachers, and of contracting with them for their support and maintenance.

Vermont, after providing freedom of conscience for all and the free exercise of religious worship in sweeping phrase, adds in Article III.:

Nevertheless, every sect or denomination of Christians ought to observe the Sabbath or Lord's Day, to keep up some sort of religious worship which to them shall seem most agreeable to the revered will of God.

Virginia, though perhaps the first State after Rhode Island to provide for absolute separation of church and state, introduces a curious inconsistency, evidently quite unconsciously, in this wise:

It is the mutual duty of all to practice *Christian* forbearance, love, and charity toward each other.*

"Tell the committee to be on the alert," were the last audible words that Jefferson spoke. His lips seemed to dictate to the fingers that still imagined a pen between them. This suggests the "eternal vigilance" that is the "price of liberty."

* (The above study of the State Constitutions is based on the study of the text found in the Convention Manual for the Sixth New York State Constitutional Convention, published in 1894. Doubtless further amendments have been enacted since then, and our attention has been called by Judge E. O. Brown of the circuit court of Illinois, to certain omissions in the New Hampshire Constitution as published in this work, bearing on the question in hand.)

Ever since the signing of the Declaration of Independence there have been those in the United States who would dispose of its fundamental contention as a "glittering generality," or limit its application to their own sect or race; but, spite of sneers, past or present, evasions and contemptuous appeals to technicalities, it still survives as the matchless document that not only liberated the United States from foreign thrall, but by its logic is destined to enfranchise the children of the world. Side by side, Jefferson's Declaration of Independence and Lincoln's Emancipation Proclamation stand in the world's library, unmatched and undimmed, to rebuke, to instruct, and to inspire unborn generations. They were and still are prophetic documents. The Civil War which Jefferson foresaw, came, and he who would study the story of civil and religious liberty in America must take note of such events as the martyrdom of Elijah Lovejoy (q.v.), and the destruction of his abolitionist press at Alton, Ill. (1837); the appearance of Harriet Beecher Stowe's 'Uncle Tom's Cabin' (1852); the execution of John Brown (q.v.) at Harper's Ferry (1859); the firing upon the flag at Fort Sumter (1861); the Emancipation Proclamation of Abraham Lincoln (1863); the surrender of Robert E. Lee at Appomattox (1865).

In studying civil and religious liberty we find that, though they may be distinguishable in their sources, they are one in their culmination. Not more clearly did the passion for religious liberty make of Roger Williams an advocate of political liberty than did Thomas Jefferson's zeal for political liberty make of him an apostle of religious liberty. The government has recently ordered published a little manuscript book of Thomas Jefferson's, entitled 'The Life and Morals of Jesus of Nazareth, Extracted Textually from the Gospels, together with a Comparison of His Doctrines with Those of Others.' In this book the author compiled the ethical and spiritual portions of the Gospel, eliminating the miraculous and theological passages. Of the compilation he himself wrote:

A more beautiful or precious morsel of ethics I have never seen. It is a document in proof that I am a REAL CHRISTIAN; that is to say, a disciple of the doctrines of Jesus, very different from the Platonists who call ME infidel and THEMSELVES Christians and preachers of the Gospel; while they draw all their characteristic dogmas from what its author never said nor saw.

The conviction indicated in this book may be right or wrong. I refer to it because it illustrates the liberty vouchsafed by the fundamental laws of the United States, which not only guarantee freedom of utterance, but lead to a respect for sincere opinions, however they may differ from prevailing opinions.

Any sketch of the history of civil and religious liberty in America would be incomplete without reference to the interesting contributions of Lord Baltimore in Maryland, of William Penn in Pennsylvania, and the Utopian schemes of John Locke and Lord Shaftesbury in the Carolinas. It is one of the interesting paradoxes of history that the Catholic Calverts, who held the most sweeping charter ever brought to the New World, should establish a standard of hospitality in religion and liberality in politics exceeding that of any other colony.

Lord Baltimore came to establish a "Palatinate," a palace county. He was made absolute

lord of a vast territory with powers to declare war, collect taxes, create legislatures, and appoint judges. But knowing from experience the heavy hand of religious bigotry, his autocracy was a benign one. It offered hospitality to the persecuted in all lands, and established many precedents precious to liberty.

The Quaker spirit represented by William Penn and his associates and successors was and is a pervasive influence, making for toleration, peace and co-operation. While the dreams which the free-thinking philosophers above mentioned tried to realize in South Carolina may be taken as forerunners of many sociological ventures on communistic or ideal lines that have followed, perhaps the most suggestive and creative of which was the work of Robert Owen at New Harmony, Ind. At any rate, from New Harmony to Altruria, the story is an attractive one to the social philosopher and a potent one in the interest of civil and religious liberty.

The law of the land demands toleration, but spiritual freedom goes further and demands appreciation and fellowship in the things about which men honestly differ. He who would study closely the development of religious liberty in America must note the discussions and agitations that gathered about the following epoch-marking addresses: Channing's Baltimore address (1818); Emerson's Divinity School address, which, to use his own words, "caused such a tempest in the Unitarian washbowl," and in consequence of which Harvard for 30 years practically exiled its most illustrious alumnus from the platform of the freest university in America (1838); Theodore Parker's discourse on 'The Transient and the Permanent in Christianity' (1841); William C. Gannett's address on 'The Faith of Ethics' (1887).

The growth of the spirit of religious liberty may be further traced by a close study of the most noted religious controversies in our history, among which were the discussion concerning the teachings of Horace Bushnell (1839–54) by the Congregationalists of New England; the withdrawal of Henry Ward Beecher (1882) from the local Congregational Association to which he belonged; the trial of David Swing (1874) by the Presbyterians of Chicago, and of Hiram W. Thomas (1881) by the Methodists of Chicago. Significant also in the history of religious liberty is the organization of the Free Religious Association in Boston (1867), and the holding of the Parliament of Religions in Chicago (1893). This was the most significant religious conclave ever held, perhaps the noblest corporate event in the history of religion. This was followed the next year (1894) by the organization of the Congress of Religion in Chicago and the subsequent organization of the New York Conference of Religion, a similar organization within State limits. Significant indications of the growth of this spirit of co-operation, which springs out of the spirit of religious liberty, are found in the numerous interdenominational organizations for practical work, such as the Young Men's and Young Women's Christian Associations, The Christian Endeavor movement, the Woman's Christian Temperance Union, the Chautauqua movement, and the various combinations for missionary work at home and abroad.

The development of civil and religious liberty is still incomplete; it still behooves "the committee to be on the alert." But the great advancement made in this direction is a magnificent guarantee of greater progress yet to be made. The high achievements already realized will inspire a continued zeal to evoke the new wisdom and fresh courage which the future of America will demand.

JENKIN LLOYD JONES, D.D.,
Editor of 'Unity.'

.50. United States — Disputed Elections in On four occasions the electoral colleges have failed to accomplish the task of choosing a President and Vice-President. In 1801, after the counting of the electoral vote, the question was left to settle which of the two men, Jefferson or Burr, should be President, and which Vice-President. In 1825, it remained to choose a President from among the three candidates, Andrew Jackson, John Quincy Adams and William H. Crawford. In 1837, it was left to determine whether Richard M. Johnson or Francis Granger should be Vice-President. In all these cases the difficulty was merely that the electors had so distributed their votes that the choice was incomplete. And the Constitution of the United States pointed out the procedure by which to complete it. The fourth case arose in 1877. The task was now thrust upon the government of deciding between rival electoral colleges in four States. This would determine whether Samuel J. Tilden and Thomas A. Hendricks, the candidates of the Democrat party, or Rutherford B. Hayes and William A. Wheeler, who were the Republican candidates, should become President and Vice-President respectively. There was no agency provided by the Constitution or laws to decide such a question.

The dispute of 1801 was a natural result of the rule laid down in the Constitution for the procedure of the electors. Each elector should vote for two persons. The person found to have the greatest number of votes should be the President, provided such number was a majority of the whole number of electors. The person having the next greatest number should be the Vice-President. But since a majority of the electors might be only one more than a quarter of the votes, and each elector cast two, it was possible for two persons to receive an equal majority vote. The constitutional provision for this contingency was that the House of Representatives should immediately choose by ballot one of the two persons for President. This vote must be taken by States, and the representation from each State should have one vote. A majority of the States was necessary to a choice. The official count of the electoral votes was made before the two Houses of Congress as prescribed by the Constitution. This was done on Wednesday 12 Feb., Jefferson himself presiding. There were 138 electors and 276 votes. The vote was distributed as follows: Thomas Jefferson, 73; Aaron Burr, 73; John Adams, 65; Charles Cotesworth Pinckney, 64; John Jay, 1. It had been anticipated that the electoral vote would not be decisive. Two days before the count the House of Representatives had adopted rules of order for the expected election. The Representatives should be grouped by States, in order to determine for whom the vote of each State was to be cast. If the preliminary vote of any State resulted in a tie, that delegation could only cast a ballot marked "divided." Each State should appoint one teller. Two ballot boxes should be

used, and each delegation should cast its ballot in duplicate. The tellers should be divided into two groups, one to examine the votes in each ballot box. The Senate was to be admitted. The House should not adjourn until the election was complete. Immediately after the count, the House of Representatives began to vote for a choice between Jefferson and Burr. By midnight 19 ballots had been taken. The sitting continued until 11 o'clock the next day, nine ballots being taken on 12 Feb. The rule against adjournment was now evaded by taking a recess. One ballot was taken 13 Feb., four on the 14th, one on the 16th, and two on the 17th. From the beginning eight States cast their ballots for Jefferson. These were New York, New Jersey, Pennsylvania, Virginia, North Carolina, Georgia, Kentucky and Tennessee. Six voted for Burr. These were New Hampshire, Massachusetts, Rhode Island, Connecticut, Delaware, and South Carolina. The remaining two, Vermont and Maryland were divided. Nine States were necessary to a choice. The House was Federalist, while both of the candidates belonged to the other party. The chief issue was the commercial policy of the next administration. As Jefferson came from Virginia and Burr from New York, New England stood by the latter. Burr did not receive the vote of his own State. This was due to Hamilton's influence. Prior to the thirty-sixth ballot, which was taken 17 Feb., some assurance was given on the question of the commercial policy. Vermont and Maryland now voted for Jefferson. At the same time South Carolina and Delaware cast blank ballots. Jefferson was thus chosen President by the vote of ten States. Burr became Vice-President. Before the next presidential election, the Constitution was amended to prevent the recurrence of such a dispute. The new amendment declares that the electors shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President.

By the official count of 9 Feb. 1826, the electoral vote for President was found to stand as follows: Andrew Jackson, 99; John Quincy Adams, 84; William H. Crawford, 41; and Henry Clay, 37. The number of electoral votes necessary to a choice was 131. The ballot for Vice-President had been decisive; for John C. Calhoun had received 182 votes. The Constitution limited the House of Representatives in its choice of a President to the three highest candidates. The first ballot gave Adams the vote of 13 States; Jackson that of 7 States; and Crawford that of 4 States. There was great popular indignation. For Jackson had received 15 more electoral votes than Adams. And besides this the Jackson electors had received a great majority of the popular vote. A rumor became current that there had been a "corrupt bargain" among the Adams and the Clay men. This seemed to be confirmed as soon as President Adams took his seat by the nomination of Mr. Clay for Secretary of State. However, it was sufficiently shown later that this story rested upon no evidence.

It was discovered by the official count of 8 Feb. 1837, that the electoral vote for Vice-President had been indecisive. The constitutional rule in such a case is that the Senate shall choose the Vice-President from the two highest numbers on the list. These were Richard M. Johnson and Francis Granger. Upon the motion of one of the members, the Senate proceeded to a viva voce vote. The result was 33 to 16 in favor of Mr. Johnson.

After the elections of 7 Nov. 1876, the first indications were that the Democratic party had chosen a majority of the electors. But the Republican party managers immediately began to claim three Southern States whose votes were likely to decide the issue. These were Florida, Louisiana and South Carolina. When the day arrived for the meeting of the electoral colleges, two sets of electors voted in each of these States and in Oregon as well. Thus four States transmitted double returns to the President of the Senate. Evidently a quarrel was before the country which might set up rival executives in the National Government, or leave the nation without an executive. Whether it is agreeable to the Constitution for Congress to regulate by law the counting of the electoral vote, we will not here discuss. The only power relating to this subject, that is expressly granted, is to determine the time of choosing the electors and the time when the electors shall meet. Laws had been enacted concerning the accepting and rejecting of electoral votes prior to 1877. The most discreet men in the government felt that Congress should devise some expedient for dealing with an unprecedented situation. The Electoral Commission law was enacted. This passed the Senate 25 Jan., the House of Representatives 23 Jan., and was approved 29 Jan. Its title was "An act to provide for and regulate the counting of votes for President and Vice-President, and the decision of questions arising thereon, for the term commencing 4 March 1877." It provided in detail for the official count as prescribed by the Constitution. It ordered that this should begin on the first Thursday in February, which was the first day of the month, and that the returns should be acted upon in the alphabetical order of the States. After the reading of each certificate, the President of the Senate should call for objections. In cases which did not involve conflicting returns, the two Houses should pass upon the objections. They should separate for this purpose. No electoral vote should be rejected except by the affirmative vote of both Houses. Section 11., the most remarkable part of the law, provided for the Electoral Commission, which was created to pass upon cases where there were double returns from a State. The Senate should choose five of its members by viva voce vote, on the Tuesday before the count began, to serve on the Commission. The House of Representatives should likewise choose five members. Five Associate Justices of the Supreme Court were also to serve. The law designated four of these under the numbers of their respective circuits, the first, third, eighth, and ninth. These were to select the fifth. When any case of double returns was reached in the official count, the certificates and papers relating thereto, together with all the objections filed in the joint meeting of the two Houses, were to be referred to the Commission. This body should decide by a majority vote the questions; whether any and what votes returned from a State are the votes provided for by the Constitution of the United States, and how many and what persons were duly appointed electors in such State. The decisions were to be final unless they were set aside by the

vote of both Houses of Congress. The members of the Commission were chosen on Tuesday, 30 Jan. The Senate was Republican at the time, while the House of Representatives was Democratic. Three of the Senators selected were Republicans and two were Democrats. The former were George F. Edmunds, Vermont; Oliver P. Morton, Indiana; and Frederick T. Frelinghuysen, New Jersey. The latter were Thomas F. Bayard, Delaware, and Allen G. Thurman, Ohio. In the House this proportion was reversed. The three Democratic members were Henry B. Payne, Ohio; Eppa Hunton, Virginia, and Josiah Abbott, Massachusetts. The two Republicans were James A. Garfield, Ohio, and George F. Hoar, Massachusetts. Of the four Justices designated by the law, Nathan Clifford and Stephen J. Field of the first and ninth circuits respectively were Democrats. William Strong and Samuel F. Miller, of the third and eighth circuits, were Republicans. Thus far the Commission was equally divided. Moreover the arguments were likely to be so strong on both sides of the different questions that the decisions would inevitably follow party lines. While the law seemed to shift the burden of decision upon 15 men, it so operated that it was really imposed upon one man. It had been expected that the four Associate Justices would select Justice David Davis to be the 15th member of the Commission. Mr. Davis was independent in politics. But he had accepted an election to the United States Senate, which was thought to make it unsuitable for him to serve. Justice Joseph P. Bradley of the fifth circuit was chosen. This made the Commission consist of eight Republicans and seven Democrats. At the final sitting Senator Thurman was unable to serve on account of illness, and Francis Kernan, New York, a Democrat, was substituted. The two most important United States laws pertaining to presidential elections were enacted 1 March 1792, and 23 Jan. 1845, respectively. The act of 1792 provides that the executive authority of each State shall cause lists of the names of the electors of such State to be certified and delivered to the electors, and that the electors shall annex one of the said lists to each list of votes. The law of 1845 declares that each State may by law provide for the filling of any vacancy or vacancies which may occur in its college of electors, when such college meets to give its electoral vote. Numerous cases came up in the count of 1877, to which these provisions were applicable. The Electoral Commission held four sittings. The first one began 2 Feb., when the returns from Florida were reached. It took a week to come to a decision in this case. The returns of the Hayes electors were certified by the Governor in office on the day when the electors met. But it was believed that the State returning board, which had declared for a Republican victory, had in canvassing the votes of the State rejected the returns from certain polling places. On the other hand, the returns of the Tilden electors were certified by the Attorney General. And there was a duplicate of the same returns certified by a new Democratic Governor. An additional cause of dispute in the case of Florida grew out of the charge that one of the Hayes electors held an office under the United States government at the time when he was elected, and was therefore ineligible. This objection was based upon the Constitutional provision that no person holding an office of trust or profit under the United States shall be appointed an elector. The decision of the Commission was based upon the ground that the returns of the Hayes electors were certified according to the law of the United States, and that the returning board had operated under the laws of Florida. To set these returns aside would be to go behind the action of the State officers. This the Commission was incompetent to do. And it would be impossible to investigate the charges of fraud. As for the one elector who was objected to on the charge that he held an office under the United States, it was concluded after hearing evidence on both sides that he had properly resigned the office. The Commission therefore held by a vote of eight to seven that the four Hayes electors were the lawful ones. This decision was reported 9 Feb. The Electoral Commission was next in session 12–16 Feb., as the official count had now reached Louisiana. This State presented the spectacle of rival governments. The Republican officers claimed authority under the canvass of the State returning board. The Democratic ones claimed that under the popular vote as cast they had been elected. The returns of the Tilden and the Hayes electors were certified by rival executives. The Commission maintained that the Republican government held office by the operation of the laws of the State. In this case, as in that of Florida, there were charges of fraud and ineligibility. But the Commission could not go back of the certificate of the State authority. Accordingly the eight Hayes electors were held to be the rightful ones. The Commission was again in session 21–23 Feb., to pass upon the returns from Oregon. The Republican party had carried the election but the Governor, who was a Democrat, had certified to the election of only two of the Hayes electors. The third certificate was issued to the highest Tilden elector on the ground that the third Hayes elector was a postmaster. As the two Republican electors refused to meet with the Democratic one, both sides preceded to fill the vacancies in the electoral college. The Republican electors appointed the man from whom the Governor had withheld the certificate. The one Tilden elector appointed two other Democrats. The Governor certified to the returns of the Tilden electors. Those of the other college were certified to by the Secretary of State. The reasoning by which the disputes about Florida and Louisiana were decided operated in this case in favor of the Tilden electors. But the Commission made a distinction. In those cases it had inquired whether the executive authority had carried out the laws of the State, and had found that it had done so. Thus it was incompetent for the Commission to inquire further. But in the case of Oregon it found that the Governor had not carried out the laws. Accordingly the Commission was competent to make him do so. Thus the three Hayes electors were recognized. On 26 Feb., the returns from South Carolina were submitted to the Commission. The votes of the Hayes electors were duly certified by the Governor. But fraud on the part of the returning board and intimidation at the polls were charged. On the second day the Commission decided that the returns of the

seven Hayes electors should be accepted. The decision in favor of the Hayes electors was made in every case by a party vote of eight to seven. Moreover the Senate voted on each occasion to accept the decision and the House of Representatives to reject it. As the count proceeded, six cases of disputed votes came up which were not referred to the Electoral Commission, as they did not involve conflicting returns. In the electoral colleges of Michigan, Nevada, Pennsylvania, Rhode Island, Vermont, and Wisconsin, respectively, vacancies had been cused by ineligibility, and the other electors had proceeded to fill the places. Some of the votes were objected to on this account. The two Houses concurred in accepting some of these, and differed with respect to others. There was no concurrent vote to reject. It was in the early morning of 2 March, only two days before the date set by the Constitution for the existing administration to come to an end, that the result of the official count was announced. The vote as accepted stood Tilden and Hendricks 184, Hayes and Wheeler 185. Thus if the decision of the Electoral Commission had been different in the case of a single elector, the contest would have been decided in favor of the other party.

After this contest was settled there were numerous movements in Congress to amend the Constitution so as to provide for disputed elections. But none of them came to anything. Several laws on the subject were also introduced. It was ten years afterward that a law disposing of such cases was enacted, the date being 3 Feb. 1887. This act is a lengthy one, and provides in detail for the certification of electors and the counting of electoral votes. Its great provision is that the States shall provide under their own laws by judicial or other methods of procedure to settle disputes as to the choice of electors. The decision arrived at within the State must be accepted. The only case that could arise for the National Government to settle would be that of rival tribunals within a State sustaining rival electors. The rule in such a case is that no vote can be rejected except by the affirmative vote of both Houses of Congress acting separately. See BALLOT; ELECTIONS.

MARY L. HINSDALE,
Ann Arbor, Mich.

51. United States — Impeachment in. Impeachment in the American national government is the formal act by which the House of Representatives makes accusations, before the Senate, against the President, the Vice-president or any "civil officers" (executive and judicial officers, except those of the army and navy) of the United States government. It is analogous to an indictment by a grand jury, though it is not confined to indictable offenses. Impeachment developed in English history before the establishment of the modern cabinet system, as a power by which the representatives of the people could control the agents of the irresponsible king, who, according to theory, could do no wrong. After the establishment of the Parliament's supremacy, and the present method of conducting the government, the custom gradually fell into disuse. One of the most noted cases was that of Warren Hastings whose trial for misgovernment in India lasted from February 1788 to April 1795, when he was acquitted. The latest case was that of Lord Melbourne in 1806.

The American colonial assemblies adopted the custom in a modified form as a means by which to check the executive and the judiciary. Though the right to remove officials was given to the general assembly by the Fundamental Orders of Connecticut in 1638, by the charter of Connecticut in 1662, and by the charter of Rhode Island in 1663, the word impeachment first appears in 1683 in the Pennsylvania frame of government, which provided that the general assembly should bring the impeachment, and that the council should try the case and pronounce judgment.

The new State Constitutions after 1775 contain provisions on the subject: Virginia (1776); New Jersey (1776); Delaware (1776); Pennsylvania (1776); North Carolina (1776); Georgia (1777); New York (1777); Vermont (1777); Massachusetts (1778); South Carolina (1778); Massachusetts (1780); New Hampshire (1784), and Vermont (1786). The New Jersey constitution of 1776 provided that the lower house should bring the impeachment and that the upper house should try it. The New York constitution of 1777 provided that the assembly should bring the impeachment and that it should be tried before a court consisting of the president, the senators, the chancellor, and the judges of the supreme court. Judgment was to extend no farther than removal from office and disqualification from holding office under the State. The methods of trying the impeachment varied, but the tendency was to have judgment pronounced by the council or senate. The Constitutional Convention of 1787 incorporated the same principle into the Constitution for application in cases of treason, bribery, "or other high crimes and misdemeanors," all of which can be punished in the ordinary courts. The House first passes a resolution to impeach and then appoints a committee to present the charges at the bar of the Senate which sits as a high court to try the case. The House also appoints a committee of managers to act for it in the trial before the Senate. At the close of the trial, after the evidence has been introduced and the arguments of the managers and of the defendant's counsel have been heard, each senator is required to vote "guilty" or "not guilty" on each of the articles of impeachment. A two thirds majority of those present is necessary to convict. The object is not to punish wrong. The penalty can be only removal from office and disqualification from further public service, but the person convicted is still liable to punishment by the ordinary courts, and he cannot receive a reprieve or pardon from the President.

In our national history this constitutional process has been invoked in seven cases; four times against federal judges, once against a senator, once against a cabinet officer, and once against a President. Only in two cases has it resulted in removal from office: Judge John Pickering in 1803 for drunkenness, profanity and violence on the bench, and Judge W. H. Humphreys in 1862 for adhering to the Confederacy. Both were district judges of the United States; Pickering for the District of New Hampshire, and Humphreys for Tennessee. In the articles against Pickering it was charged that he made decisions contrary to law in a suit involving the

seizure of a ship and that he appeared upon the bench "in a state of intoxication, produced by the free and intemperate use of inebriating liquors, and did then and there frequently in a most profane and indecent manner invoke the name of the Supreme Being." Judge Pickering did not attend the trial, but his son entered a plea of insanity and consequent irresponsibility, stating that his father for over two years had been altogether incapable of transacting any kind of business which required the exercise of the judgment or the faculties of the reason; and therefore incapable of corruption of judgment, and therefore that he was "not amenable to any tribunal for his actions." The House managers held that the insanity was the result of habitual drunkenness. On 12 March 1803 he was convicted and removed by a party vote, the Federalists voting in the negative, but the further disqualification to hold office was not inflicted.

Judge Humphreys at the beginning of the Civil War had engaged actively in the secession movement, but had not resigned his position as judge of the Federal District Court for Tennessee. In May 1862, the House preferred against him seven articles of impeachment, based on a secession speech made by him at Nashville, 29 Dec. 1860, on his acceptance of office under the Confederacy, and on his action in the arrest and imprisonment of W. G. Brownlow, a citizen of the United States in violation of his rights. Judge Humphreys made no defense and on 26 June 1862, he was convicted by unanimous vote of the Senate. The proceeding was merely a formal means of declaring his office vacant.

Justice Samuel Chase of the Supreme Court, appointed by President Washington in 1796, an able but partisan judge who frequently indulged in political harangues in his jury charges, and who had incensed the Jeffersonian Republicans of the House by his conduct in certain trials under the Sedition law, was impeached before the Senate in December 1804 on eight charges relating to arbitrary and unjust conduct, and to highly indecent and extra-judicial reflections upon the government of the United States before the Maryland grand jury. He was found not guilty, probably because it was believed that "his conduct had been rather a violation of the principles of politeness than of the principles of law; rather the want of decorum than the commission of high crime and misdemeanor."

Judge J. A. Peck of the Federal District Court for Missouri was impeached in 1830 on the charge of unduly punishing, for contempt of court, an attorney who had published a criticism of a decision of the judge in a land case (1827). He was acquitted by a vote of 24 against 21.

The case of William Blount, senator from Tennessee, seems to have settled that senators and representatives are not impeachable, on the ground that they are not civil officers. On 7 July 1797, the House, having evidence that Senator Blount was conspiring to transfer New Orleans and adjacent territory from Spain to Great Britain, by means of a hostile military expedition from the territory of the United States, decided to impeach him. Two days later, he was expelled from the Senate, and soon thereafter he was elected to the Tennessee Senate. In December 1798, the House managers presented the case before the Senate of the United States for trial. Blount did not appear, but his counsel (Jared Ingersoll and A. J. Dallas) entered a plea that the Senate had no jurisdiction, since a senator is not a "civil officer" of the United States. The Senate sustained this plea and Blount was discharged for want of jurisdiction. The defense also made the plea that Blount, having been expelled, was no longer a senator, and could not be punished after he was out of office for acts done while he was in office.

It is still an open question whether an officer can escape impeachment and trial before the Senate by resignation or dismissal from office. This subject was discussed in the case of William W. Belknap, who was impeached in 1876 for using his position as Secretary of War as a means of securing bribes from an Indian agent whom he had appointed at Fort Sill. A few hours before his impeachment, he resigned his office and his resignation was accepted by the President. Belknap's counsel made the plea that the House had no power to impeach anyone who by resignation or otherwise had ceased to be "a civil officer of the United States." By a vote of 37 to 29 the Senate decided that Belknap was amenable to trial by impeachment. On most of the articles 36 senators voted "guilty" and 25 voted "not guilty," and thus Belknap was acquitted. More than one third of the Senate refused to vote for conviction, on the ground of lack of jurisdiction over an officer who had resigned. This precedent may not be regarded in future cases, however.

The most prominent case of impeachment in our history was that of President Andrew Johnson. It was the result of the violent controversies concerning policies of reconstruction, and was inspired largely by party motives. The President vetoed some of the most important measures of Congress and belligerently condemned its policy of reconstruction. Congress passed all important measures over his veto, and sought to reduce his power and influence in other ways, especially by the Tenure of Office Act of March 1867. Johnson denounced Congress in very intemperate language, and by demanding the resignation of Edwin M. Stanton, Secretary of War, attempted to ignore the Tenure of Office Act which had stripped from him the power to remove executive officials. The House was thoroughly aroused, and on 3 March 1868, brought articles of impeachment against him, on 11 charges, principally of a political nature and based chiefly on his alleged violation of the Tenure of Office Act. The event was considered so momentous that the Senate in accord with the conviction of the Chief Justice who presided, drew up and adopted its own formal rules of procedure.

On 23 March, the court of impeachment convened and the reply of the President was read by his counsel. He denied any intention of violating the Constitution, or of attempting to bring Congress into disgrace or to ridicule it. Testimony was taken and then the arguments of the attorneys were filed. Party excitement and passion ran high, and on 16 and 26 May, after a long trial, the Senate by a vote of 35 to 19 decided that he was guilty of the principal charges. This lacked one vote of the two thirds majority necessary for conviction. (The court then adjourned *sine die* by a vote of 34 to 16.) The necessary two thirds was not obtained, largely because some of the leaders in the Senate feared

that conviction might result in the permanent subordination of the executive to Congress. Seven Republican senators voted against conviction. The failure to convict was a public advantage, but the President did not win with dignity — for even while the trial was in progress he traveled about, making passionate speeches against Congress.

In the States, officers are removable either by a two thirds vote of the legislature, or by impeachment by the lower house and trial in the senate. Though there have been over 40 attempts to remove, there have been very few cases of actual removal from office by impeachment. One governor and a few judges have been removed, and there have been several cases of resignation while under impeachment in order to avoid conviction.

Bibliography.— 'American Law Register' (March 1867); 'Annals of Congress,' 8th Congress, first session (pp. 315–68); Appleton, 'Annual Cyclopedia' (1868–76); Benton, 'Abridgement of Debates' (Vols. 10 and 11); 'Congressional Globe,' 37th Congress, second session; Dewitt, 'Impeachment and Trial of Andrew Johnson'; Foster, 'Commentaries on the Constitution of the U. S.'; Hildreth, 'History of the United States'; 'House Reports of Committees 44,' 37th Congress, second session; Lalor, 'Cyclopedia of Political Science,' Vol. 2; Moore, 'History of Congress'; 'Papers of American Historical Association' (Vol. 4, pp. 145–77); Pomeroy, 'Constitutional Law'; Wharton, 'State Trials.'

J. Morton Callahan,
Professor of History, West Virginia University.

52. **United States — The President's Office.** The theoretical model for the new executive officer of the "more perfect Union" was the king of England. Practically the framers were guided by such models as the colonial governors and the official heads of the recently formed States. Having determined upon a single executive, such details as the tenure, powers, and method of choice of this officer were matters for careful adaptation and of mutual compromise. The result formed a sufficiently important part of the new frame of government to cause its opponents to style it "a monarchical constitution," and to concentrate their attack upon the proposed executive. Still popular confidence in Washington as the unanimous choice for this position caused even this opposition to fail.

The ultimate position of the American president was not determined till the end of Jackson's administration. Washington established the office upon a broad national basis, but even he could not render it strictly non-partisan. Jefferson first exemplified the method of conduct by a brilliant and successful party leader. Under his weaker successors the congressional caucus nearly destroyed the independence of the executive, and it was the great work of Jackson to restore the office to a co-ordinate position with Congress and the Judiciary. He was aided in this work by the rise of the national convention, which destroyed the power of the congressional caucus, and by the development of party machinery, based upon executive patronage and a subsidized press. The convention and party machine, however, rendered the selection of a second-rate party man a greater future possibility. Polk showed the influence of a successful war upon the executive power, but it was under Lincoln that the war powers of the President reached their highest development. His successor, Johnson, was unable to maintain this high level and narrowly escaped impeachment in his attempt to resist the encroachments of Congress. Many important assertions of executive authority occurred during Cleveland's administration, but the most important development of recent times occurred under McKinley in connection with the colonial problems growing out of the Spanish-American War.

The Choice of the President.— In the convention of 1787 the method of selecting the new executive presented a most perplexing question. The natural methods of choice — by the legislative assembly or by the people at large — were both rejected. After passing over propositions to elect the President by the suffrages of the State governors and by electors chosen by districts, the convention, as a result of one of its most important compromises, adopted the expedient, suggested by Maryland's experience, of giving to each State a number of presidential electors equal to its senators and representatives. These electors, who supposedly would represent the intelligent people of the States, were to vote for persons for president and a majority of all electors was necessary for a choice. By 1800 the chief defect of this plan was revealed in the tie vote for Jefferson and Burr, and this led to a speedy adoption of the Twelfth Amendment to permit electors to signify their choice for President and Vice-President, and to make possible a definite party selection. By this article of the Constitution the legislatures of the various States are to determine the method of choosing the electors; and in the first election five of these chose them without reference to the people at large. In 1832 Delaware and South Carolina alone retained this method, which the latter continued till 1860. Since that date, Colorado selected its delegates by its legislature, in the election of 1876. Election by districts was employed by Massachusetts in 1788, and by four States in 1808. Maryland, with the temporary exception of Michigan, in 1892, was the last to give up this system. After 1836, the practice of a popular choice of electors, upon a general State ticket, was in universal use outside of South Carolina. In 1845 Congress prescribed for the whole Union the present general election day.

Technically, the President is not chosen until the counting of the electoral votes, in February, before the assembled Senate and House of Representatives. An unsuccessful attempt was made in 1800, to determine to what extent each house should participate in this ceremony, especially in the case of a contested vote. In 1865, owing to a question about the returns from the "reconstructed" States of Tennessee and Louisiana, Congress hastily adopted the "Twenty second Joint Rule," which provided for a separate vote by each house upon disputed election returns. This joint rule was suspended, in 1877, by the famous "Electoral Commission," consisting of five members of the Supreme Court and five from each house. This commission passed upon the returns of each State, and by a party vote seated Mr. Hayes. In order to avoid the recurrence of such a dispute, the 49th Congress, in 1877, passed the law providing that Congress should not go behind the returns issued by regu-

larly accredited State officers, and thus left to each State the determination of its own electoral vote.

The Presidential Succession.— The natural successor of the President, in case of his disability or removal, is the Vice-President, who is chosen in the same manner as the President. Five of the twenty-six Presidents have reached the higher office through the vice-presidency. The law of 1792, the first to regulate the succession, provided for the accession, after the Vice-President, for the purpose of ordering a new election, of the president *pro tempore* of the Senate, and after him, of the speaker of the house. This plan was open to the objection that during the intermission between two congresses, neither of these officials was in existence. Accordingly it was superseded by the act of 1886, which provides, that in case of the death of both President and Vice-President, the secretary of state shall succeed, and after him, in order of seniority, the other members of the cabinet.

Powers, Obligations, and Privileges of the Presidency.—Since 1871 the annual compensation of the President has been $50,000, with special appropriations for the care of the executive mansion. In general the life of a President is characterized by a simple dignity. The first two presidents attempted a series of stately public ceremonials, which their successors wisely abandoned. The President endeavors to keep in touch with public sentiment, particularly through his official advisers — the members of the cabinet. It was at first proposed that this body should exercise a definite check upon the President, but it was clearly perceived that the power of the Senate over treaties and appointments was sufficient for this purpose. The Act of 1789 creating the office of secretary of state permitted the President to remove a secretary without previously consulting the Senate. This power has been used on two occasions only. As head of the army and navy the President exercises an extensive appointing power in peace, and actual command in war. He also has the direct appointment of some 5,000 civil officials of higher rank, and indirectly influences the appointment of all others. A few of the President's appointments are made upon his own responsibility; all others with the advice and consent of the Senate. The latter body before making an appointment has occasionally requested additional information, which Jackson and Cleveland uniformly refused to furnish. The accompanying power of removal, which does not extend to judges or army and naval officers, has generally been construed as a necessary adjunct to the President's duty to see that the laws are faithfully executed. This power, sparingly used by the early presidents, was definitely employed by Jackson in building up a personal party machine. It formed an important factor in succeeding elections, and was extensively used by Lincoln; but it has been greatly curtailed since 1883 by the extension of the civil service system. The power of removal has rested almost exclusively with the President, the only exception occurring in 1867, when Congress passed the Tenure of Office Act to curb Johnson; but in 1869 the most important portion of it was repealed, and the remainder in 1885.

The President exercises a potent influence upon legislation, often due to his position as a great party leader, to his communications to Congress, his veto power and enormous patronage. The veto power was copied almost verbatim from the Massachusetts constitution of 1780. In theory, by means of it, the President wields a power equivalent to one sixth the whole number of senators and representatives, but practically he is far more potent. The first six presidents made rare use of the veto. Jackson found it useful in reasserting the co-ordinate power of the presidency. Hayes made use of it to prevent the addition of "riders" to appropriation bills; Cleveland, more extensively than any other President, to defeat special pension legislation. The first two presidents opened each Congress in person by a speech; their successors have preferred to make written communications to that body, and these have often proved influential in initiating legislation or in forcing a party issue to the front. Moreover, it is upon the presidency that the judiciary depends for the enforcement of its decrees. This dependence and the check upon legislation serve to maintain the presidency in its co-ordinate position.

ISAAC JOSLIN COX,
Department of History, University of Pennsylvania.

53. United States — The Vice Presidency. By provision of the Federal Constitution, a Vice President of the United States is elected at the same time, for the same term, and in like manner as the President:— by electors chosen in each of the States. A majority of the votes cast in the several electoral colleges is necessary to an election. The Vice President is the president of the Senate, and in the event of an equal division in that body, he gives the deciding vote. Under no other contingency has he a vote. The powers and duties of the office of President devolve upon the Vice President in case of the death, resignation or removal from office, of the President. The Vice President is included in the category of public officers liable to removal from office on impeachment and conviction for treason, bribery or other high crimes and misdemeanors. By the twelfth amendment to the Constitution no person constitutionally ineligible to the office of President shall be elected to that of Vice President. In the event of a vacancy occurring in the office of Vice President, the Senate is presided over by a member of that body. In such contingency the death of the President would, under existing law, devolve the office of President upon the Secretary of State. Twenty-five persons have held the office of Vice President; their names and the dates of their respective elections are as follows, viz: John Adams of Massachusetts, elected in 1788, re elected in 1792; Thomas Jefferson of Virginia in 1796; Aaron Burr of New York in 1800; George Clinton of New York in 1804, re-elected in 1808; Elbridge Gerry of Massachusetts in 1812; Daniel D. Tompkins of New York in 1816, re-elected in 1820; John C. Calhoun of South Carolina in 1824, re-elected in 1828; Martin Van Buren of New York in 1832; Richard M. Johnson of Kentucky in 1836; John Tyler of Virginia in 1840; George M. Dallas of Pennsylvania in 1844; Millard Fillmore of New York in 1848; William R. King of Alabama in 1852; John C. Breckenridge of Kentucky in 1856; Hannibal Hamlin of Maine in 1860; Andrew

Johnson of Tennessee in 1864; Schuyler Colfax of Indiana in 1868; Henry Wilson of Massachusetts in 1872; William A. Wheeler of New York in 1876; Chester A. Arthur of New York in 1880; Thomas A. Hendricks of Indiana in 1884; Levi P. Morton of New York in 1888; Adlai E. Stevenson of Illinois in 1892; Garrett A. Hobart of New Jersey in 1896; Theodore Roosevelt of New York in 1900.

Three Vice Presidents were subsequently elected President, viz: John Adams in 1796; Thomas Jefferson in 1800 and 1804; and Martin Van Buren in 1836. The dates given have reference to the election by popular vote of the electors in the several States, by whom the President and Vice President were subsequently chosen. Six Vice Presidents died in office, viz: Clinton, Gerry, King, Wilson, Hendricks and Hobart. In the Presidential contest of 1836 Martin Van Buren received a majority of the electoral votes for President, but no candidate received a majority for Vice President. By constitutional requirement the duty of electing a Vice President then devolved upon the Senate; the candidates from whom such choice was to be made being restricted to the two who had received the highest number of electoral votes. One of these, Richard M. Johnson of Kentucky, was duly elected by the Senate. The only Vice President who resigned the office was John C. Calhoun. This occurred in 1832, and Mr. Calhoun soon thereafter took his seat in the Senate, to which body he had been elected by the Legislature of South Carolina.

Five Vice Presidents have, upon the death of the President, succeeded to the Presidency. The first President to die during his incumbency of the great office was William Henry Harrison; his death occurred 4 April 1841, just one month after his inauguration. The Vice President, John Tyler, then at his country home in Virginia, was officially notified of the event, and upon reaching the seat of government at once took the oath of office as President. There was much discussion for a time in and out of Congress as to his proper title, whether "Vice President of the United States acting as President" or "President." The language of the Constitution, however, is clear, and it is no longer controverted that upon the death of the President the Vice President becomes in name as in fact — President. Upon the death of President Zachary Taylor, 9 July 1850, Vice President Millard Fillmore succeeded to the Presidency, and was at a later date an unsuccessful candidate for election to that office. The third Vice President who reached the Presidency by succession was Andrew Johnson; this occurred 15 April 1865, the day following the assassination of President Lincoln. President Garfield was shot 2 July 1881 and died in September of that year, when he was succeeded by Vice President Chester A. Arthur. Vice President Roosevelt was the successor of President McKinley, who died by the hand of an assassin in September 1901.

Two attempts have been made to secure the impeachment of the President; — the incumbent in each instance having been elected Vice President, and succeeded to the higher office upon the death of the President. A resolution looking to the impeachment of President Tyler was introduced into the House of Representatives in January 1843, but being defeated no further steps were taken. Articles of impeachment for "high crimes and misdemeanors" were presented by the House of Representatives, against President Johnson in 1868. By constitutional provision the trial was by the Senate, the Chief Justice of the United States presiding. Less than two-thirds of the Senators voting for conviction, he was acquitted.

No constitutional provision existed until the adoption of the 12th amendment for separate votes in the electoral colleges for President and Vice President; the candidate receiving the highest number of votes (if a majority of all) became President, and the one receiving the second highest, Vice President. In 1801 Jefferson and Burr each received 73 electoral votes, and by constitutional requirement the election at once devolved upon the House of Representatives, voting by States. Upon the 36th ballot, a majority of the states voting for Jefferson, he became President, and Burr Vice President. The constitutional amendment above indicated — by which separate ballots were required in the electoral colleges for the two offices — was the result of the intense excitement throughout the country engendered by this contest. The earnest opposition of Alexander Hamilton to Aaron Burr in the above mentioned contest, was the prime cause of the duel by which Hamilton lost his life at the hands of Burr, in 1804.

George Clinton, the fourth Vice President, had as a member of the Continental Congress voted for the Declaration of Independence, and held the rank of Brigadier General during the war of the Revolution. The fifth Vice President, Elbridge Gerry, had been a prominent member of the Constitutional Convention of 1787. William R. King, elected in 1852, by reason of ill health, never entered upon the discharge of the duties of his office. By special act of Congress, the oath of office was administered to him in Cuba and his death occurred soon thereafter. Of the 25 Vice Presidents thus far elected, nine have been taken from the State of New York. Adams and Jefferson, the first and second Vice Presidents, rendered valuable service to the young Republic at foreign courts, each by election was elevated to the Presidency, and their deaths occurred upon the same historic 4 July — just 50 years from the day they had signed the Declaration of Independence. A marble bust of each of the Vice Presidents has been placed in the gallery of the Senate chamber. The office of Vice President is one of great dignity. He is the presiding officer of the most august legislative assembly known to men. In the event of an equal division in the Senate he gives the deciding vote. This vote, many times in our history, has been one of deep significance. It will readily be seen that the contingency may often occur when the Vice President becomes an important factor in matters of legislation. See also UNITED STATES — PRESIDENTS AND VICE PRESIDENTS OF.

ADLAI E. STEVENSON,
Ex-Vice President of the United States.

54. United States — Speaker of the House of Representatives. The constitution of the United States provides that: "The House of Representatives shall choose a speaker and other

officers, and shall have the sole power of impeachment." Even if the power to choose a Speaker had not been expressly conferred by the Constitution, the House, as a legislative body, would have possessed the inherent authority to elect or appoint a presiding officer and such other officials as might be necessary to enable it to transact its business in an orderly and regular manner, and to make and preserve a record of its proceedings. As the Constitution does not prescribe the manner in which the Speaker shall be chosen, the House itself must determine the mode of election, and, therefore, may order a vote to be taken in any way that will ascertain the choice of a majority, or the choice of a plurality, in case it shall have previously been determined that a plurality may elect. Although no rule has been adopted upon this subject, it is customary to choose a Speaker by calling the names of the members present who have filed regular credentials with the clerk, and by recording their votes in the journal. Pending the election, the clerk of the last preceding House of Representatives (q.v.) presides, and it is his duty to preserve order and decorum and to decide all questions of order, subject, however, to appeal by any member. The Speaker is nominally elected to preside during the Congress then existing, but there is no constitutional or statutory provision, nor any rule of the House fixing the term of office, and, as he is merely an officer of the House, it would seem that he might be lawfully deposed at any time by the election of another to take his place. By statute, in England, it is provided that, in case of a dissolution of Parliament, the then Speaker of the House of Commons shall continue in office until one shall be chosen by the new Parliament, and that, in case of his death, disability, or absence from the realm during any dissolution or prorogation, three of the commissioners of the House of Commons shall act for him in regard to the offices of the House. In this country, the office becomes vacant immediately upon the adjournment of Congress (see CONGRESS OF THE UNITED STATES), and there is no one authorized to act until a new Speaker is elected by the next House, but, as already stated, the clerk presides over the new House until a Speaker is chosen. During the sitting of Congress, the Speaker may designate a member to discharge the duties of the office in his stead, but this substitution cannot extend beyond an adjournment. In case of his illness, however, he may, with the approval of the House, make such appointment for a period not exceeding ten days; but, if he is absent and has omitted to make an appointment, the House elects a Speaker pro tempore.

The Speaker is nominated and elected by the members of the party with which he is affiliated, and the office is one of great political importance. His powers and duties differ in many respects from those appertaining to the office of Speaker of the House of Commons, and he exercises much greater influence in directing the course of legislation and in political matters generally than the presiding officer of any other legislative body in the world. He not only presides over the deliberations of the House and preserves order and decorum, but he appoints all standing committees and all select and conference committees ordered by the House, and, inasmuch as the member first named on the committee becomes its chairman, the Speaker determines who shall occupy all those important positions. In constituting the important standing committees, chairmanships are always given to members of the Speaker's political party, and this is also generally the case in the appointment of select and conference committees. This power to appoint the standing and select committees is generally exercised by the presiding officers of legislative bodies in the United States, but it is not vested in the Speaker of the English House of Commons or in the Speaker of the House of Commons of the Dominion of Canada. Originally, the House of Representatives appointed all the important committees by ballot, and the Speaker appointed only such as consisted of not more than three members, an arrangement which confined his power to control legislation, otherwise than by the exercise of his personal and official influence, within very narrow limits as compared with the present system.

The Speaker is chairman of the Committee on Rules, consisting of himself and four other members, who are appointed by him. All proposed action relating to the rules, joint rules, and order of business must be referred to this committee for consideration and report, and it, therefore, practically decides what legislative measures shall be taken up for consideration in the House, when they shall be considered, what time shall be allowed for debate, and what amendments, if any, shall be offered and voted on. While it is true that its reports, in order to become binding upon the House, must be agreed to by that body, yet, the committee itself is so constituted that it represents the views of the majority of the House, especially when political questions are involved, and the adoption of its recommendation is generally little more than a mere form.

The Speaker must rise from the chair to put a question to the House, but he may state it sitting. There are four different methods of taking the sense of the House on a pending proposition: First, by the voices, the members who vote in the affirmative saying "Aye," and those voting in the negative saying "No." If the Speaker doubts, or if a division is called for, he directs those in the affirmative to rise from their seats and be counted, and after he has made the count and announced the number, those voting in the negative rise and are counted. If he still doubts, or if tellers are demanded by one fifth of a quorum, the Speaker designates two members, one from the affirmative side and one from the negative side, to count the votes for and against the measure and report the result to him. Even after all these methods are resorted to, if the yeas and nays are demanded by one fifth of the members present, the Speaker directs the clerk to call the roll, and the names of those voting are entered on the journal. It is frequently the case that the votes are taken in all these different ways upon the same question before the result is finally ascertained and announced.

When the House resolves itself into a committee on the whole, the Speaker leaves his

place and designates a member to preside as chairman. In case of disorder in the committee, the regular practice is for the committee to rise by vote and report the fact to the House, but there have been occasions when the Speaker, having knowledge of the disorder, has summarily resumed the chair and restored order without the formality of a vote by the committee to rise and report.

It is the duty of the Speaker to sign all acts, addresses, joint resolutions, writs, warrants, and subpœnas ordered by the House, and to decide all questions of order as they arise, subject to appeal by any member. Being a representative himself, he has the right to vote on all questions in the House and in committees of the whole, but, under the rules, he is not required to vote in ordinary legislative proceedings, except in case when his vote would be decisive or when the House is voting by ballot. When there is an even, or tie, vote, the question is lost, and the Speaker, therefore, does not vote unless he is in favor of the measure. According to the general parliamentary law, the Speaker has no right to speak except on questions of order, but, in the House of Representatives, he has several times participated in the debates without asking the consent of the House; and it is not unusual for him to speak and vote in committees of the whole.

He is required to take the chair on every legislative day at the time to which the House shall have adjourned at its last sitting, and, on the appearance of a quorum, it is his duty to cause the journal of the last day's proceedings to be read, having first examined and approved it. Generally, however, the reading of the journal is dispensed with by unanimous consent of the House. If no quorum attends at the hour of meeting, or if it appears at any time during the sitting that no quorum is present, he has no power to adjourn the House on his motion, as is the case in the English House of Commons. Under the Constitution, a majority of the House constitutes a quorum to do business, but it is provided that a smaller number may adjourn from day to day and may be authorized to compel the attendance of absent members, in such manner and under such penalties as it may prescribe. Accordingly, it is provided by rule that 15 members, including the Speaker, shall be authorized to compel the attendance of absent members, and, consequently, the House is not disabled and forced to adjourn because there is no quorum present.

The Speaker has the power to appoint and remove for cause the official reporters of debates for the House, and he prescribes regulations for the admission of the representatives of the press to the reporters' gallery. He has also control over the hall of records and the unappropriated rooms in that part of the Capitol assigned to the use of the House. Under the statutes of the United States he appoints from the membership of the House three visitors to the Military Academy (q.v.), three to the Naval Academy (q.v.), a consulting trustee of the Reform School of the District of Columbia, two directors of the Columbia Hospital for Women, three regents of the Smithsonian Institution (q.v.), and two members of the Memorial Association of the District of Columbia.

Since the organization of the government under the Constitution, on 30 April 1789, there have been 58 Congresses, but owing to the fact that in many cases the same person was several times re-elected to the office, there have been only 33 permanent Speakers of the House. Of the 33, 4 were Representatives from Massachusetts, 4 from Virginia, 4 from Kentucky, 3 from Pennsylvania, 3 from Indiana, 2 from New Jersey, 2 from South Carolina, 2 from Georgia, 2 from Maine, and 1 from each of the States of Connecticut, North Carolina, New York, Tennessee, Ohio, Iowa, and Illinois. The Speaker who held the position longer than any other was Henry Clay, of Kentucky, who was elected six times; but he did not serve six full terms, having resigned from the office twice before the expiration of the Congresses for which he had been chosen.

Under the Constitution, Congress may provide by law for the case of removal, death, resignation, or inability, both of the President and Vice-President, designating what officer shall then act as President, and, by a statute passed 1 March 1792, it was enacted that in such a case the President of the Senate, or, if there should be none, the Speaker of the House, for the time being, should act as President until the disability should be removed or a President should be elected. This statute remained in force until 19 Jan. 1886, when Congress passed another act providing that in case of the removal, death, resignation or inability of both the President and Vice-President, the secretary of state, or, if there should be none, or, in case of his removal, death, resignation, or disability, the secretary of the treasury, shall act as President, and that the right of succession shall pass next to the secretary of war, then to the attorney-general, postmaster-general, secretary of the navy, and secretary of the interior. The Department of Agriculture and the Department of Commerce and Labor had not then been created, and, consequently, the secretaries of these departments are not included in the act, and they are not in the line of succession. Although the act of 1792 remained in force nearly 95 years, the contingency provided for never occurred. This was fortunate for the country, because there were grave doubts as to its constitutionality, and, if the offices of both President and Vice-President had at any time become vacant, the succession of the President of the Senate or the Speaker of the House might have been seriously contested. The questions which would have arisen are: (1) Whether the word "officer" used in the Constitution did not mean an officer of the United States; and, if so (2) whether the President of the Senate and the Speaker of the House are such officers, or are only representatives of the States or the people, chosen by the two branches of Congress to preside over their deliberations.

JOHN G. CARLISLE,
Ex-Speaker of the House of Representatives.

55. United States — History of Arbitrations. International arbitration is a voluntary submission of certain definite points in an international dispute to the decision of a third party. (The decision of the arbitrator or court of arbi-

tration is binding except when the award is outside of the points submitted, equivocal, impossible, influenced by fraud or corruption, or a denial of justice.) It is largely the outgrowth of the complex international relations of the 19th century which have resulted in a growth in the recognition of international duties and liabilities. From 1800 to 1900 there were 136 important international arbitrations and many minor commissions.

The United States has taken the lead in several very important adjustments. She began her national existence with many unsettled questions, and as she settled them there arose many new problems demanding solution. With a desire to substitute reason for force in settling disputes, she has accepted international arbitration as a prominent feature of her policy. Her arbitrations have embraced many kinds of international controversy, and many important questions of law, both public and private, some of which might have resulted in expensive wars.

With Great Britain.—Arbitrations with Great Britain have been the most important. The first cases arose under the Jay Treaty of 1894, articles 5, 6, and 7 of which provided for three mixed commissions: (1) To settle the identity of the Saint Croix River, which was specified in the treaty of 1783. The commission in 1798 decided upon the Schoodiac. (2) To decide what compensation, if any, was due British subjects who had been unable to collect debts in some of the States where the terms of the treaty of 1783 had been disregarded. The board of five arbitrators met at Philadelphia in 1797, quarrelled, and adjourned in 1798. The matter was finally settled by the treaty of 1802 which awarded Great Britain £600,000. (3) To settle questions regarding contraband, rights of neutrals, and prize court decisions. This commission met at London. There were several interruptions (and the disagreement of the Philadelphia commission caused a suspension from July 1799 to February 1802), but it completed its work in 1804. Its work was very important in determining subsequent international law (q.v.).

After the cases wisely provided under the Jay treaty, there followed a period in which the effects of European wars rendered arbitration practically impossible, and produced an extraordinary train of circumstances which finally precipitated the Anglo-American War of 1812. Since that war every vexatious question which has arisen with Great Britain has been settled by arbitration in case direct negotiation failed. Articles 4, 5, 6, and 7 of the Treaty of Ghent of 1814 provided for three commissions or boards of arbitration: (1) To determine the title to certain islands in Passamaquoddy Bay. At New York in 1817, the board made its award, substantiating in the main the British claims. (2) To determine the northeast boundary of the United States, from the source of Saint Croix to the Saint Lawrence. The board met at Saint Andrews in 1816, and held its last meeting at New York in 1822, but reached no agreement. By a convention of 1827 the points of difference were referred to the King of the Netherlands, who, in 1831, proposed a compromise line which neither party was willing to accept. The matter was finally settled by the Webster-Ashburton treaty of 1842. (3) To determine the boundary through the middle of the lakes to the upper end of Lake Huron and then to the Lake of the Woods. The commission agreed upon the first part in 1822 and finally adjourned in 1827 leaving the boundary westward from Lake Huron through Lake Superior to the Lake of the Woods unsettled till the Webster-Ashburton treaty of 1842.

By the treaty of 1818 the question in dispute as to the obligation of Great Britain to return the slaves which she had in her possession at the time of the signature of the Treaty of Ghent was referred to the Emperor of Russia who in 1822 decided that Great Britain had not complied with the Treaty of Ghent, and that she should pay to the United States an indemnity. The mixed commission which was selected to fix the amount of compensation finally agreed, on most points, but adjourned in 1827, its functions having been ended by the ratification of a convention concluded at London in 1826 by which the United States received $1,204,906.

A convention at London in 1853 provided for a claims commission which ended its sessions in 1855, after giving important decisions regarding fishery rights, and rendering awards in the famous McLeod and Creole cases. The reciprocity treaty of 1854 provided a commission to adjust disputes regarding fishermen which might arise under the treaty, but no resort was made to the stipulation. In 1855, a commission was organized to determine the reciprocal reserved fisheries rights, under the reciprocity treaty, which had renewed the privileges renounced by the United States in the convention of 1818 as to in-shore places. The work was concluded in 1866.

In 1857 commissioners were appointed to determine the boundary under the treaty of 1846, there having been a disagreement in regard to the San Juan water boundary — as to the middle of the channel separating Vancouvers Island from the continent. They held six informal meetings in 1857 and finally disagreed. Discussion of the boundary continued until the Civil War, and was resumed in 1866. The Senate failed to vote upon the convention of 1869 for the submission of the question to the arbitration of the President of the Swiss Confederation. Under the treaty of 1863 commissioners were appointed to settle the claims of the Hudson's Bay Company (q.v.) and the Puget Sound Agricultural Company arising under the Oregon treaty of 1846. In 1869 they awarded $450,000 and $200,000, respectively, to the companies, which in turn executed deeds relinquishing all claims.

The greatest arbitration treaty was that of Washington (1871) which provided for four distinct arbitrations: (1) The question of the San Juan water boundary was referred to the Emperor of Germany who in 1872 rendered an award in favor of the American claim to the Haro channel. (The boundary was fixed by protocol in 1873.) (2) The American claims for losses from Confederate cruisers of British origin (Alabama claims, q.v.) were referred to the Geneva tribunal, which in 1872 awarded $15,500,000 to the United States. (3) The claims and counter-claims growing out of the Civil War (outside of the cruiser claims) was referred to a mixed commission which in 1873 awarded Great Britain $1,929,819. (4) The

claims for American use of the northeastern fisheries (of Nova Scotia) were referred to a commission of three persons which met at Halifax in 1877 and awarded $5,500,000 to Great Britain.

Under a treaty of 1892, a commission was created to settle the Bering Sea controversy (q.v.) as to sealing. It met at Paris in 1893 and decided that the United States can claim no exclusive rights in sealing in Bering Sea except within three miles of the coast of her territory, though it favored the American plea for the necessity of regulating pelagic sealing. Under the decision of this commission, there was created a new commission (1896) which awarded $471,151 to the Canadian sealers whose vessels had been seized. In 1897 the question of the boundary between Alaska and the British possessions was submitted to a board of arbitration. After considerable delay, the arbitrators met at London (1903) and decided the main points in favor of the American contentions.

There have been two important Anglo-American cases in which a third party was involved: (1) Under a convention of 1889 between the United States, Great Britain and Germany, to settle conflicting interests in the Samoan Islands (q.v.), the nomination of the chief justice of the Islands was to be referred to the King of Sweden in case the three powers could not agree. In 1899, a joint high commission, which was sent to investigate the complications which had arisen, decided that a partition of the Islands between the United States and Germany was the best solution of the problem. An agreement for partition was signed at Washington in December of the following year. (2) In 1890 the United States, Great Britain and Portugal agreed to submit to three eminent jurists, to be selected by the President of Switzerland, the settlement of a dispute caused by the seizure and the annulment of the charter (by Portugal) of the Delagoa Bay Railway, which had been constructed under a concession to an American.

Among the more important arbitrations with other nations are the following:

With Spain: A commission, under article 21 of the treaty of 1795 with Spain provided for a commission which met at Philadelphia in 1797–9 and awarded $325,440 to the United States for depredations on American commerce before 1794. To settle spoilation claims arising after 1795 a commission was appointed in 1802, but the provision governing it were rejected by the United States. Diplomatic relations which were suspended in 1805 were resumed at the close of the Napoleonic wars and resulted in the Treaty of Florida, in 1819, by which all claims were adjusted. In 1870, on the suggestion of Secretary Fish, the case of the Colonel Lloyd Aspinwall, an American vessel seized near Cuba by the Spanish authorities, was submitted to a board of arbitration which met at New York in the same year and awarded $19,702 to the United States. By an agreement of 1871 a mixed commission was created to adjust claims resulting from the Cuban insurrection. It met at Washington and concluded its labors by February 1883. In 1885 the question of damages for wrongful seizure and detention of the American bark Masonic was referred to Baron Blanc, the Italian minister at Madrid.

With France: The United States and France have not succeeded well in settling their disputes by arbitration. In 1800 they agreed upon a convention for settling disputed claims for depredations after 1788. France did not carry out faithfully her part of the agreement, but in 1803 she concluded another convention providing a commission and the payment of claims. Subsequent depredations produced new claims which France delayed to pay. In 1831 these claims and French counter-claims were adjusted by a commission which awarded the United States an indemnity of $5,558,108. The delay of France in paying led to a rupture of diplomatic relations, but through the mediation of Great Britain in 1836 the claims were paid. In 1880 a board was created to adjust the claims growing out of the Mexican troubles of 1862–7, the American Civil War and the Franco-German war (q.v.). It completed its work in 1884, and awarded $612,000 to France.

With Mexico: By the treaty of 1839 with Mexico, the adjustment of miscellaneous claims was submitted to a mixed commission, composed of two Mexican commissioners and an umpire (a citizen of Prussia). In the treaty of 1848 the United States and Mexico agreed to submit all disputes to arbitration, and in 1868 they provided for the settlement of all claims after 1848 by a joint commission which held its first meeting in 1869 and finally completed its work in 1876. The award was in favor of the United States ($4,125,622 in favor of citizens of the United States and $150,498 in favor of citizens of Mexico), but Mexico delayed final settlement, claiming that the award was unjust. Under the convention of 1889 (and in harmony with the arbitral boundary stipulations of the treaties of 1828, 1853 and 1882) a permanent board, called the International Boundary Commission, was established to determine questions arising from changes in the course of Rio Grande and the Colorado rivers along the boundary between the United States and Mexico.

With Venezuela: In 1866 a mixed commission was created to settle American claims against Venezuela. In 1868, it awarded $1,253,310 to the United States. Fraud being charged, the claims were finally (1885) submitted to a second commission which in 1890 awarded $980,572 to the United States. Another claims case with Venezuela was that of the Venezuela Steam Navigation Company in 1892.

Among other cases that have been arbitrated are the following: Claims for the brig General Armstrong in 1851 (with Portugal); Panama riot claims, in 1857–62 (with New Granada); claims for the brig Macedonia, 1858–63 (with Chili); claims for the United States and Paraguay Navigation Company, 1859 (with Paraguay); claims against Costa Rica, in 1860; claims against Ecuador, in 1862; Columbian claims of 1861 and of 1864; Peruvian claims, 1863 and 1868–9; claims for the steamer Montijo 1874 (with Columbia); Pelletier and Lazare claims, 1884 (with Hayti); Bokkelen claims, 1888 (with Hayti); the Carlos Butterfield claims, 1888 (with Denmark); Chilean claims, 1892–4; the Santos claims, 1893–6 (with Ecuador).

In addition to submitting its own cases to arbitration, the United States through its officials (the President and diplomatic representatives) has acted as arbitrator in several cases. She has acted as mediator in numerous cases, the

most important being to secure an armistice between Spain and the several trans-Andean South American countries in 1871, and in adjusting a long standing boundary dispute between Chili and the Argentine Republic in 1881. Her government has often created tribunals, under the own statutes, to execute conventional obligations and to settle questions of international relations.

There have been many memorials and petitions presented to Congress on the subject of international arbitration. In 1874 a resolution in favor of general arbitration was passed by the House. In 1888 the President and Congress received a communication signed by 233 members of the British Parliament urging the negotiation of an arbitration treaty. In 1883 Switzerland proposed to the United States the inauguration of international treaties providing for arbitration. The President of the United States assented to the proposal. In 1890, the Senate (the House concurring) adopted a resolution in favor of arbitration. Negotiation between the United States and Great Britain for a general and permanent treaty of arbitration soon followed, and in 1897 a treaty was concluded and sent to the Senate by President Cleveland. President McKinley also urged its ratification, but it failed to get the necessary two thirds vote. The United States is a party to the Hague convention adopted at the Hague Peace Conference, 29 July 1899. See also ARBITRATION; INTERNATIONAL LAW; DIPLOMACY; TREATIES.

Bibliography.— Moore, 'History and Digest of International Arbitrations to which the United States Has Been a Party' (1898); Balch, 'International Arbitrations' (1896); Balch, 'The Alabama Arbitration' (1900); 'Report of the American Historical Association' (1891).

J. MORTON CALLAHAN,
Professor of History, West Virginia University.

56. United States — Growth and Development of Law in the. The history of law, or of the relations of the members of society to each other and of all to the state, is a history of organic growth. Upon it the various phases of political, social and economic activities of a people have left indelible traces. The history of American law is from the beginning somewhat complex, but it represents the development of legal principles in the feeble and scattered colonies of the 17th century into the diversified yet systematic body of law in force to-day in a nation whose inhabitants differ in their various needs as widely as they are distributed geographically. The heterogeneous character of administration in the various colonies, the organic change from British colonies to independent states, the welding of the separate states into a national union, the taking-over of certain legal powers and duties by the Federal government under the Constitution and the consequent growth of a federal jurisprudence, partly opposed and partly complemental to that of the states, the addition of new territories by conquest and purchase, each in turn becoming states under the Constitution,—all these have been factors in producing the differentiated body known as American jurisprudence. In order to understand the development of American law, its history may be divided roughly into four periods: (1) The period of settlement, extending through the 17th century; (2) The period of organization, covering the 18th century to the Revolution; (3) The period of extension, from the Revolution to about 1850; and (4) The period of modern law and procedure from about 1850 to the present time.

The Period of Settlement. (1607–1700).— The year of the settlement at Jamestown, Va., was also the year of Calvin's case (7 Coke's Reports, 17), which upon a state of facts quite disconnected with colonial matters laid down the theory of the English courts as to the position of dependencies. This was that English statutes did not bind dependencies, as parcels of the realm in tenure, unless they were specially named. At a later time in the cases of Blankard vs. Galdy (2 Salk. 411) and Campbell vs. Hall (1 Cowper 204) this principle was more elaborately developed, and Blackstone lent to it the weight of his authority. That English subjects going to a new and uninhabited country carried with them, as their birthright, the laws of England existing at the time of colonization, was a supplemental corollary of the former principle. While such was the theory accepted by English courts, it does not follow that during the colonial period it was adopted in its entirety by the colonists themselves.

The English settlements in America varied so much in their origin and spirit that at first no general legal principles were consciously adopted. The early London Company which exploited Virginia had few purposes in common with the Puritans who aimed at a theocratic form of government in Massachusetts. Their different aims were apparent in the laws adopted for the regulation of the colonies. Nowhere were trained lawyers to be found among the early settlers, and the profession of law was not only held in no esteem, but the lawyer was for a long time denied the privilege of practising for hire. This distrust of the legal profession was under the circumstances not unnatural. The common law of England in the early 17th century had become harsh in its methods, rigorous in its procedure and technical in its practice. It was founded upon precedents which grew out of old social and religious conditions with which the emigrants not only had little sympathy but from which they had also sought to escape. The settlement of hitherto unoccupied territories made necessary a new order of things in which were erected new institutions fitted for a scattered population, a rude society and a simple economic system. All of the colonists had, however, as a part of their English birthright and inheritance, certain deeply-rooted traditions which included a knowledge of and reverence for the great principles of the English common law, which assured the fundamental rights of person and property. Familiar with representative government, they brought with them belief in the adequacy of statutes as a means of bringing law into conformity with the needs of society. Moreover, some notion of the orderly arrangement of statutes into codes was not wanting to the settlers. At the beginning, therefore, dependence was placed upon statute law to the exclusion of judge-made law. Such dependence is to be explained by the new conditions in which the colonists were placed, their distance from the mother-country and the absence of trained lawyers.

The radical differences in the character of the colonists were reflected in their statutory enactments. The theocracy of Massachusetts found expression in the Body of Liberties (1636) in which the Mosaic code was adopted. The Connecticut code (1643) was similar. The early code of Virginia (1612) was exceedingly severe and it was modified soon after the colony had its own legislative assembly. The commercial spirit of the colony's promoters asserted itself in the laws which aimed at the economic regulation of the colony. While the criminal codes, judged by the standards of the present, seem harsh, yet in comparison with the criminal law of England, they were mild, for while the laws of Connecticut specified 12 crimes for which the death penalty was provided, there were 200 offenses punishable by death under the English law. No other colony introduced a system of codes so all-embracing and modern in spirit as did Pennsylvania, which by its frame of government and fundamental laws embodied the opinions of the most enlightened statesmen of the time with the modifications which experience had found necessary. In Maryland, owing to the continued disagreement between the proprietors and the people, no formal code of laws was in force. The colonists accordingly claimed that they were governed by the common law of England in so far as it was applicable to the local conditions existing. The proprietor opposed this claim as in derogation of his rights and the controversy was not settled until well into the 18th century.

The almost universal adoption of codes which restated legal principles remained to be put in force by the colonial courts. The constitution of these courts was as various as was that of the colonies. Everywhere the trial courts were presided over by men untrained in the law; the procedure was of the most informal kind. Whether, as in Virginia, the county court consisted of eight or ten gentlemen holding commissions from the governor, or as in Rhode Island, where the judges were elected annually by the people, there was little chance for a systematic declaration of the law based upon precedent. It is the universally accepted theory of American jurisprudence that the colonists brought with them such parts of the unwritten common law of England as was suited *mutatis mutandis* to the conditions of colonial life. Where the colonial codes were silent, however, the early colonial judges did not consciously draw upon English precedents for their decisions. Knowing little and caring less for the technicalities of the law and having no lawbooks, they decided cases not covered by the codes according to the rules of substantial justice as between man and man, taking as in Massachusetts (1646) "the words of eternal righteousness and truth as the rule by which all kingdoms and jurisdictions must render account," or, as in Virginia (1631) "doing equal right to poor and to rich after their cunning, wit and power and after the laws and customs of the colony and as near as may be after the laws of England." While the systems of grand and petit juries were everywhere to be found, their powers differed from their English originals; the respective provinces of the court and petit jury were not clearly defined. Contrary to the English practice, evidence was frequently submitted in writing; pleading was according to no rule, and while the terminology of the common law was used, the precise meanings of legal phrases were overlooked. Peculiarly English provisions were modified or abrogated. The theory of feudal tenures was abolished save in those colonies, as in Maryland, where the proprietary system prevailed. Primogeniture had no existence in Massachusetts, Connecticut or Delaware and the eldest son was given a double portion in lieu thereof. Appellate procedure was as informal as was that of the trial courts. Usually the method was by appeal to the governor and council or assembly, not upon reserved questions of law, but by a review of the whole case upon its merits. Appeals beyond the highest authority in the colony to the King in Council were generally and successfully denied by the colonial governments.

In the founding of separate colonies, distinct in character one from another, by resourceful and self-reliant Englishmen were the beginnings of American jurisprudence. The "wise and salutary neglect" of the mother-country did much to make early American law peculiar to itself.

Period of Organization (1700–1776).—During the 18th century and prior to the Revolution, law and procedure tended toward a common type in all the colonies. The causes of such a change from the variant beginnings of the century previous were not only political, but social and economic. Increase of population by immigration, mostly from England, and by natural increase, added wealth, growth of towns and better facilities of inter-communication rendered the crude administration of the earlier period insufficient for colonial needs. The revocation of colonial characters and the organization of crown colonies led the way to greater uniformity of administration. Common grievances started a national feeling. All of these forces aided in creating a common public sentiment which found its expression in law either directly through legislation or indirectly from the bench. During this period were laid the foundations of a later constitutional law. Every inhabitant of a charter colony was interested in the legal proceedings in England concerning the charters, in which were involved definite and fundamental principles of public law. Furthermore, sentiment in these colonies agreed that if a colonial legislature enacted laws not in accordance with the powers granted by charter, the act was void. Familiarity with colonial charters bred a belief in the wisdom of written constitutions; and the practice of declaring void all legislative enactments in conflict with charter powers assisted in building up the later theory of constitutional legislation, state and federal.

As a part of the political education of the period was the growing conviction, long held in Maryland, that the common law of England, modified in certain matters by parliamentary enactments, was the supreme law; that it was one and the same for each colony and that by means of it every one was guaranteed in his rights as an Englishman. Appeals to England, which at an earlier time had been discouraged, were now a matter of right, so that if a colonial court failed to declare the law in accordance with the common

law, an English court of appeal had jurisdiction to remedy the error. As the judges in the crown colonies were appointed during good behavior and tended therefore to hold to prerogative, their decisions in matters of public right were apt to be unpopular.

The appearance of trained lawyers and the removal of the ban placed upon the legal profession had much to do with the change in procedure. Local prejudices and slip-shod methods of practice gave way before a regulated system based upon the common law. Not until the second half of the 18th century, however, was the American lawyer a person of great public influence. The generation which stood for political independence and furnished men of affairs was one of lawyers. English lawbooks and reports were imported. Procedure was copied from that obtaining in the English courts. Pleading according to the rules of the common law as introduced with all the old technicalities.

Holding by commission from the crown, the colonial governor assumed to a greater or less extent the functions of a chancellor and gave relief in equity. As the governor derived his chancery powers from the king, recourse to him was never popular. While in England equity had become an independent system under the chancellorship of Lord Hardwicke (1736–56), in the American colonies the chancery courts remained in a rudimentary state. In every colony, however, there was a court having a semblance of chancery powers. Pennsylvania adopted in her early codes a system unique in the history of jurisprudence, in that in the courts of the colony, having both law and equity powers, equitable rights were administered under common law forms.

The period may be characterized as one in which courts were organized as far as possible like those of England, rendering decisions according to the common law, introduced by lawyers and welcomed by the people as a part of their liberties. The uniform character of the common law superseded local custom as far as practicable, while the earlier colonial codes covering many matters of criminal law and necessarily local economic regulations remained in force.

The Period of Extension (1776–1850).— The legal changes entailed by the War of Independence were largely of a constitutional character, a discussion of which is beyond the scope of the present article. The ideas of which the Revolution was the outgrowth, contributed vastly to the development of an American jurisprudence sufficiently distinct from that of England and of the later colonial period as to be a separate system. Speculative writers like Montesquieu exerted an influence which was apparent not only in matters of constitutional organization but also in the habits of thought of the American bar. Of the 56 signers of the Declaration of Independence 35 were lawyers. The American nation began not so much with the promulgation of a revolutionary manifesto as by a declaration of principles of law, the fruit of American legal minds. It is of no little significance that more copies of Blackstone's 'Commentaries,' the first systematic exposition of English law, were sold during the 18th century in America than in England.

Independence brought about a change in the fundamental organization of every state. Each adopted a written constitution or (as in Rhode Island and Connecticut) continued in force its colonial charter as a sufficient declaration of constitutional matters, and in each it was necessary to construe them. Experience and theory left such construction to the courts and the supreme rule which guided was that of the common law. In every state varying written constitutions construed according to the principles of the common law tended to the formation of fairly uniform ideas of constitutional law. The Federal Constitution provided what the Articles of Confederation had almost completely lacked. The courts authorized by the Constitution acquired jurisdiction not only of constitutional questions, disputes between states and admiralty matters, but also, within certain limitations, of cases wherein citizens of different states were parties. Both the Articles of Confederation and the Constitution provided that full faith and credit should be given to the proceedings of a state court by the courts of every other state and an essentially national character was impressed upon American jurisprudence. Thus, while the federal courts had exclusive jurisdiction in certain cases (a power which the decisions of Chief Justice Marshall greatly increased), the division was not as between matters of purely public and those of private law. All the courts, state and national, became necessary and component parts of one symmetrical system, in which there was one approximately uniform mode of procedure, that of the common law of England, consciously adapted to American needs. Judges appointed by popularly elected governors or elected directly by the people, decided questions of law and equity presented by lawyers who had none of the class traditions of the English barrister. The American lawyer was from the first amenable to democratic influences. The requisites for admission to the bar were determined by state laws and not by slavish adherence to the traditions of the Inns of Court. The lawyer knowing no distinction between barrister and attorney, as obtained in England, gave advice to clients and tried their cases himself; he was not a member of a caste but of a more or less democratic society. The position which he assumed was one in which activity in politics was expected as well as accessibility to clients in matters more particularly concerning his profession. The influence of the American bench and bar has generally been to assist in making law to conform to social needs, or, in other words, in the democratization of law.

When the American colonies became independent, each was governed by (1) the common law of England, in so far as each had tacitly or expressly adopted it as suited to local needs; (2) those English statutes which were amendatory of the first; (3) the colonial statutes and (4) such customs as were peculiar to American conditions and incorporated in judicial decisions. In order to give authority to these earlier laws, nearly all of the original thirteen states formally adopted them either by a constitutional provision, as in Delaware (1776) and New York (1777), or by legislative enactment as in Pennsylvania (1777). The method of adopting English statutes was by no means uniform

Vermont recognized the statute laws of England as existing prior to 1760, in so far as they were not repugnant to the constitution and laws of the state. The beginning of the American Revolution (19 April 1775) was the date set in New York, and English statutes locally applicable and enacted prior to that time were declared in force. In Pennsylvania only those English statutes which were admittedly valid during the colonial period were continued. The Virginia convention of 1776 adopted the common law and English statutes of a general nature which had been enacted prior to 1607. This action was taken as a precedent in the first extension of law over territory belonging to the federal government. The United States adopted the language of Virginia and extended the common law under the same limitations to the Northwest Territory. The Ordinance of 1787 was the foundation of the jurisprudence of the states carved out of federal territory. In Michigan, while the English statutes were afterward expressly repealed, the substance of them was re-enacted and to prevent any confusion as to what system of law existed, the old *Coutume de Paris,* once in force when Michigan was a French possession, was declared abrogated. In Louisiana a different policy was followed. The Territory of Orleans, afterward the State of Louisiana, formed the most populous portion of the Louisiana Purchase. French in spirit and tradition, its institutions had been developed according to French ideas modified somewhat by Spanish influence. The civil law of France and Spain was continued in force. Thanks largely to the influence of the code prepared by Edward Livingston, who had in turn been influenced by Bentham, Louisiana is the only state of the Union whose jurisprudence is not based upon the common law. In the other states of the old Louisiana Purchase, the common law was adopted, as was proper according to the theory of the extension of law over territories hitherto uninhabited. In all the western states, formed out of territory originally Mexican, the practice was the same and in all of them the common law is presumed to exist. While common law powers were given to the courts in their entirety, in no State was there created an equity court having the full and complete jurisdiction which such a court had in England. Chancery courts, when created by legislative enactment, have had their powers conditioned and circumscribed by the law creating them.

The Period of Modern Law and Procedure (1850 to the present).— The theory of American government is that the state and the people are one. In nothing has this theory produced more definite results than in law. This is true not only in positive legislative enactments made by the people's representative but in the indirect legislation of the bench, formulated by judges, the servants of the people. While it is the function of a judge to declare and not to make law, he may be a potent factor in bending old law to new needs. The irresistible tendency toward universal suffrage and the enormous increase in population which characterized the middle of the 19th century, at once left marks upon law and procedure. The states of the middle west, which drew a large share of their inhabitants from Europe, entered upon an era of constitution-making. In these new expressions of fundamental rights, the middle states put aside traditions, according to which their first constitutions had been framed, and built upon a democratic basis. The statutes, which up to that time were of comparatively small bulk, were revised and put into codes. Some states (for example, Ohio, Indiana, and Iowa) abolished all common law offenses and rebuilt their systems of criminal law upon a statutory basis. Impatience was felt at the technical methods which the courts had used and the adoption of the Reformed Procedure was the expression of this dislike.

In 1848 David Dudley Field, an eminent lawyer of New York, succeeded in having the legislature of that State adopt a code of civil procedure which effectually broke away from all tradition and aimed at the simplifying of civil pleading and practice by the abolition of all distinctions between actions at law and in equity. According to the reformed theory, there is but one form of action, based upon a complaint containing a simple statement of the facts constituting the grievance for which redress is asked in a judgment settling the rights, whether legal or equitable, of all the parties to the action. This theory was well calculated to appeal to the imagination of democratic commonwealths; one after another state adopted the New York plan as a whole or in part, and the Reformed Procedure is now in force in all but a few of the states. This system was, so far as pleading was concerned, an entirely new idea; it was neither a modification of the common-law method nor an adaptation of the various forms of equity pleadings. The code furnished its own rules for the construction of pleadings upon its own peculiar principles. Whether or not the Reformed Procedure as in force in many states has resulted in simplicity is a question for legitimate difference of opinion. In some jurisdictions the constant tinkering with the laws of practice and procedure by the legislature has rendered that branch of the law so uncertain that probably more than one half of the questions of law presented to courts of appeal are upon questions of trial or appellate procedure.

The second half of the 19th century was marked by stupendous development in industrial enterprise. Steam and electricity revolutionized the forces of production and distribution, and necessitated the employment of vast combinations of capital. Substantive law, as expressed in statute and decision, has tried to follow as closely as possible this industrial and commercial evolution. Contracts, once a small part of the body of law, now occupy a position once undreamt of. Insistence upon the form of a contract has given way to reasonable interpretation of its matter, viewed according to the changing conditions of commerce and trade. Corporations, once created only by the express favor of a sovereign, were given a new character such as modern society and its industrial enterprises demanded. But two hundred private corporations were organized in the United States prior to 1800, and of these a dozen only were designed to engage in manufacturing. Capitalistic production with its consequences created anew the purpose and idea of a private corporation. Individuals, none of whom had at command sufficient capital to

float a large enterprise, joined their funds and in their associated capacity received as a matter of right a charter from the state. The charter, the powers of which were limited by the law of its authorization, at first special and afterward general, gave the corporation a personality having certain rights. As a consideration for these rights, the corporation assumed certain statutory burdens and regulations. Unless by the express or implied authority of its charter, a corporation cannot engage in business outside of the jurisdiction creating it. In other states it is a foreign corporation. As such, the other states may stipulate the conditions under which it may enter to do business. Here the Federal Constitution steps in. Under it Congress has the power to prescribe rules for the regulation of inter-state commerce. The organization of railway systems extending through several states and the increase in production of large manufacturing corporations, selling their output in many states, have given opportunities for national legislation. The diverse citizenship of corporations and the large interests represented by them have brought a constantly increasing number of cases into the federal courts. Thus the American law of corporations, a compound of national and state legislation and of federal and local decisions, is of increasing bulk and variety and no subject of the law has grown into greater importance, save perhaps the division of purely constitutional law, affecting personal rights.

For nearly two centuries and a half after the English colonies were planted in America, American jurisprudence changed gradually, keeping in harmony with the political and social conditions of the colonies and states. Then with a great wave of immigration and far-reaching industrial changes and the occpuation of a continent from ocean to ocean, American jurisprudence set itself to meet the needs of a modern and complex society. The result has been an enormous product of legislation and a much bulkier output of decisions from the federal and state courts. A system of law, to be sound, must have an orderly development; it must be progressive and not revolutionary. Many of the changes which have taken place in America have likewise been adopted in England and for the same reason as in this country. Since 1875 the English procedure has been similar to the American. Both the English and American systems of jurisprudence are, therefore, parts of one great system, based upon the common law of England and built to satisfy the requirements of a modern commercial and industrial society, wherein personal freedom has the greatest possible play. Its idea of personal right is its heritage from the common law. See also various articles under Law.

Consult: 'Two Centuries'; 'Growth of American Law'; Kent, 'Commentaries'; Story, 'Commentaries on the Constitution'; Minor, 'Institutes of Common and Statute Law'; Cooley, 'Constitutional Law and History'; Robinson, 'Elements of Law'; Holmes, 'The Common Law'; Pomeroy, 'Equity Jurisprudence' and 'Remedies'; Fisher, 'Evolution of the Constitution of the United States' and 'Administration of Equity through Common Law Forms'; Reinsch, 'English Common Law in the early American Colonies'; Sioussat, 'English Statutes in Maryland'; Field, 'Law Reform in the United States'; Wilson, 'Courts of Chancery in America.'

Jesse S. Reeves,
Attorney, Richmond, Ind.

57. United States — Intellectual Development of. If we search through history for the original forces from which all modern intellectual development seems to have proceeded, we undoubtedly trace these influences to Greece and Rome; but we find that there was, from the first, one essential difference between the two nations. Cicero, the greatest of Romans, points out that poets came late to Rome, but orators early. This is equally true of the United States of America as compared with European states, for Americans surprised older nations by developing statesmanship and oratory before a literature, in any proper sense, was born. There had been, here and there, in this country, detached fragments which might pass for literature, single sayings, fine passages, brief descriptions; but scarcely any purely original literary work had been done in any systematic way, at least none now much sought by the reader. Samuel Sewall wrote private diaries which were unconsciously amusing; Madam Sarah Knight wrote narratives of travel which are to this day readable, and were meant to be such. Mather wrote with great quaintness and sometimes with rhythmical beauty in his 'Magnalia.' Freneau wrote poetry, Jonathan Edwards wrote theology, but none of these is now extensively read, not even 'Edwards on the Will'; they are scarcely reprinted. Yet from the very first, the Revolutionary War brought forth an exhibition of statesmanship, in the documents sent forth by Jay, Lee, and Dickinson, which won the respect of the best European critics. Lord Chatham said in the House of Lords on 20 Jan. 1775, "I must declare and avow, that in all my reading and observation — and it has been my favorite study — I have read Thucydides, and have studied and admired the master-states of the world — that for solidity of reasoning, force of sagacity, and wisdom of conclusion, under such a complication of difficult circumstances, no nation or body of men can stand in preference to the general Congress at Philadelphia." Meanwhile, Horace Walpole, the most brilliant English writer of his time, foresaw that the War of Independence had also remoter results to bring with it and had predicted to his friend Mason, two years before the Declaration of Independence, that there would one day be a Thucydides in Boston and an Xenophon in New York.

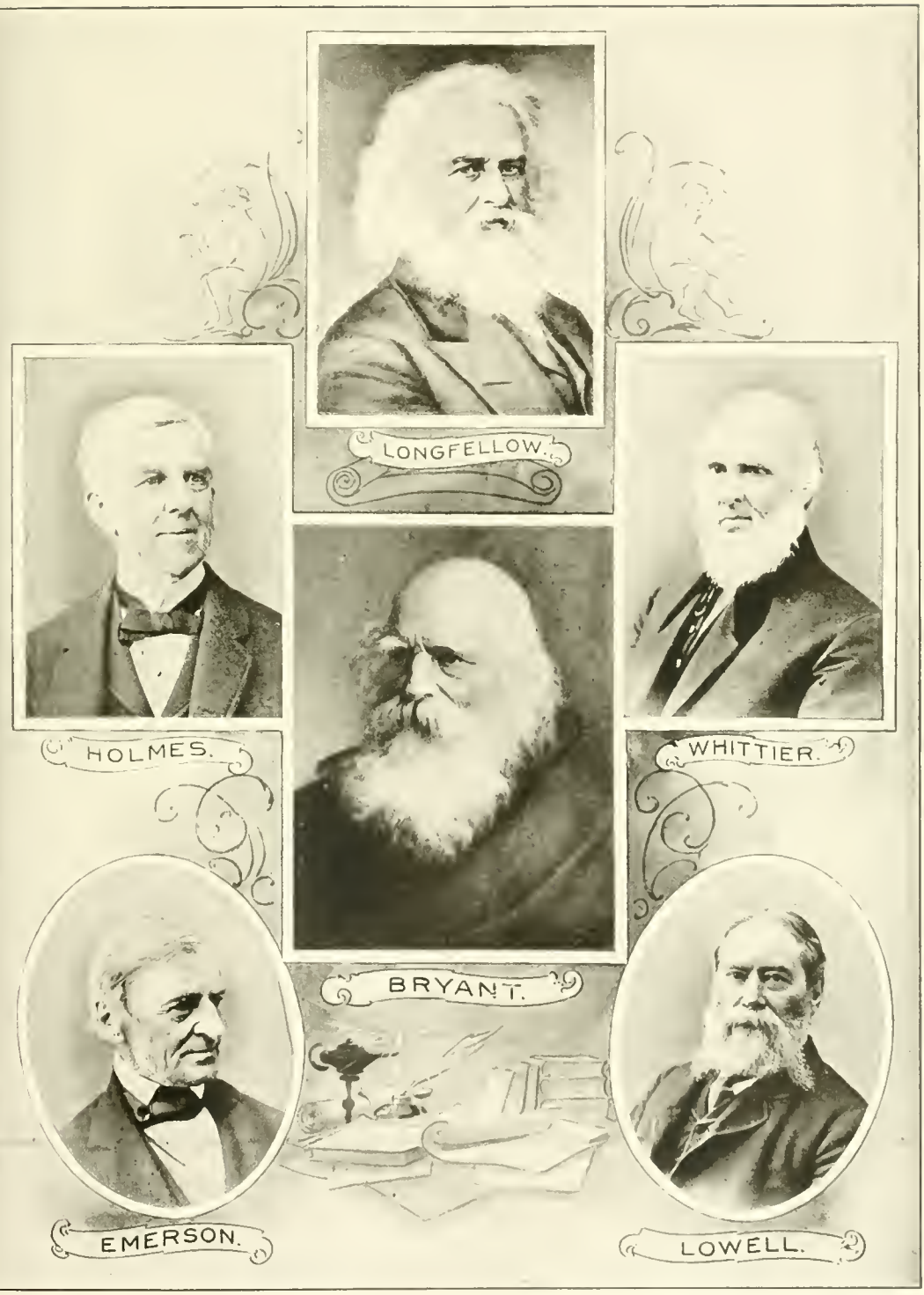
It must be remembered that the American Revolution took place when English literature as well as American was experiencing an ebb tide. For more than a century, the mother country had produced nothing in any high, imaginative direction; nothing, that is, between the death of Milton in 1674 and the publication of Burns' poems in 1786, and of Coleridge's and Wordsworth's 'Lyrical Ballads,' in 1798. The men of that period in England — as even Johnson, Pope, Addison, DeFoe, Goldsmith, Gibbon, Sterne,— however highly esteemed in their day, were wanting on the ideal side; and the readers of a higher standard were glad to turn away from them all to collections of wayside poetry like

Percy's 'Reliques' and Scott's 'Border Minstrelsy.' Accordingly when Fisher Ames, being laid on the shelf as a statesman, wrote the first really important essay on American literature — an essay first published in 1899, after his death — he treated literature itself as merely one of the ornaments of despotism. He wrote of it, "The time seems to be near, and, perhaps, is already arrived, when poetry, at least poetry of transcendent merit, will be considered among the lost arts. It is a long time since England has produced a first-rate poet. If America has not to boast at all what our parent country boasts no longer, it will not be thought a proof of the deficiency of our genius." Believing as he did, that human freedom could never last long in a democracy, he thought that perhaps when liberty had given place to an emperor, this monarch might desire to see splendor in his court and to occupy his subjects with the cultivation of the sciences. At any rate, he maintained "After some ages we shall have many poor and a few rich, many grossly ignorant, a considerable number learned, and a few eminently learned. Nature, never prodigal of her gifts, will produce some men of genius, who will be admired and imitated." The first part of his prophecy failed, but the latter part fulfilled itself in a manner quite unexpected.

The point which was ignored by Fisher Ames and by the whole Federalist party of his day was that there was already created on this side of the ocean, not merely a new nation but a new temperament. How far this temperament was to arise from a change of climate, and how far from a new political organization, no one could then foresee, nor is its origin yet fully analyzed; but the fact itself is now coming to be more and more recognized. "As I take it, Nature said, some years since,—'Thus far the English is my best race; but we have had Englishmen enough; now for another turning of the globe, and a further novelty. We need something with a little more buoyancy than the Englishman; let us lighten the structure even at some peril in the process. Put in one drop more of nervous fluid and make the American.' With that drop, a new range of promise opened on the human race, and a lighter, finer, more highly organized type of mankind was born." This remark by an American called down the wrath of Matthew Arnold who called it "tall talk" or a species of brag, overlooking the fact that it was written as a physiological caution addressed to this nervous race against overworking its children in school. In reality, it is a point of the greatest importance. If Americans are to be merely duplicate Englishmen the experiment is not so very interesting, but if they are to represent a new human type, the sooner we know it, the better. No one finally did more to recognize this new type than when Matthew Arnold himself wrote afterward ('Nineteenth Century' for September 1887) "Our countrymen [namely, the English,] with a thousand good qualities, are really, perhaps, a good deal wanting in lucidity and flexibility," and again in the same essay, "The whole American nation may be called 'intelligent,' that is, quick." This would seem to yield the whole point between himself and the American writer whom he had criticised.

One of the best indications of this very difference is the way in which American journalists and magazinists are received in England and their English compeers among ourselves. An American author connected with the 'Saint Nicholas Magazine' was told by a London publisher that the plan of the periodical was essentially wrong. "These pages of riddles at the end, for instance," he said, "no child would ever guess them"; and though the American assured him that they were guessed regularly every month in 20,000 families or more, the publisher still shook his head. In the same way, they tell you many stories in London about Englishmen who have called on Mr. Choate or Mr. Depew to express their somewhat tardy appreciation of something very facetious said by them at some dinner-party the night before, but with which the auditor did not fairly grapple at the time. In the same way, Professor Tyndall used to say that whereas in his London lectures he made it a practice to explain each experiment three times,— once before he began to perform it, secondly, while the experiment was going on, and thirdly, after it was all over,— he soon found that in America, he could omit one at least of these elucidations, and when he grew more accustomed to the fact could get on with only one out of the original three. He used, furthermore, to quote the leader of a company of Ethiopian minstrels with whom he took the voyage home from America and who had been accustomed to have his joke begin with the man in the middle of his semi-circle of performers, then to have it continued by one of the end-men, and finally brought to a climax by the other; but who, to his disgust, found every American audience laughing at his joke long before its full announcement was officially made. This quality in Americans, though commonly noticed most in matters of humor, is in reality temperamental in all directions and makes Americans not only better jokers, but better orators, better inventors, and even better business men than their English compeers. In all these different walks the quality is accompanied by possible drawbacks; quickness may end in too much haste, while slowness may imply deliberation and mature conviction. One notices in Parliament in what a hesitating and even bungling way the debaters often begin their remarks, while an average American would slide in far more easily. On the other hand, Americans doubtless find it harder to leave off and may well envy the pungent closing remark with which the Englishman often sits down. As to the element of humor in itself, it used to be the claim of a brilliant New York talker that he dined through three English counties on the strength of the old jokes which he found in the corners of an American 'Farmer's Almanac' which he had happened to put into his trunk.

It is to be doubted how thoroughly the English mind recognized this lighter intellectual element, either in Franklin or in Irving, though both were favorites in that country. But no one can help observing how much more promptly it was appreciated, if vaguely, on the part of Frenchmen. From Brissot and Volney, Chastellux and Crèvecoeur, down to Ampère and De Tocqueville there was an appreciation of this lighter quality which was denied to the English and this certainly seems to indicate that the change in temperament had already begun to show itself. Ampère especially notices what he


LONGFELLOW.
HOLMES.
WHITTIER.
BRYANT.
EMERSON.
LOWELL.

calls "*Une veine Européenne*" among the educated classes. Many years after, when Mrs. Frances Anne Kemble, writing in reference to the dramatic stage, pointed out that the theatrical instinct of Americans created in them an affinity for the French in which the English, hating exhibitions of emotion and self display, did not share, she recognized in our nation this tinge of the French temperament, while perhaps, giving an inadequate explanation of it.

It is a curious fact that this lighter element in the American, though visible even under the veil of Puritanism — as, for instance, where Samuel Sewall dwells so dotingly upon his long series of successive courtships — and still more apparent in the early southern writers, as in William Byrd, yet seemed to disappear during the period of the Revolution. Franklin, Adams, and Fisher Ames alone showed it among the grave orators of the Revolution, and so strong an impression was left by this that the kindly French observer, Philarète Chasles, made it a definite assertion in his *Etudes sur la Littérature et les Mœurs des Anglo-Americans* (Paris 1851) that all America did not even then possess a humorist ("Toute l'Amérique ne possède pas un humoriste," p. 339). He did not even recognize humor in Washington Irving, but regarded him only as a literary follower of Pope and Addison, while finding much charm in him and calling him the Wouvermans of American Literature. Beyond this, he could find no humorist, although already there was a boy of 16 on a Mississippi steamboat who was to take the lead among the humorists of the world, under the name of Mark Twain.

The literary development in the United States of America followed very closely on the organization of its government and its first headquarters lay for that reason in Philadelphia. The First Continental Congress met there, the Declaration of Independence went forth thence in 1776, and the Federal Constitution was put in shape there in 1787. All these were successive steps in the intellectual development of America, but construing the phrase more strictly, we also find that Philadelphia produced the first monthly magazine, the first daily newspaper, the first religious magazine, the first religious weekly, the first penny paper or illustrated comic paper or juvenile magazine or mathematical journal ever published in the United States. We also notice that the city produced or, at least, adopted and reared the first American writer of international reputation in Benjamin Franklin, and the first imaginative writer, or indeed, professional writer of any kind, in Charles Brockden Brown, the novelist. Franklin's personal history and also his innate humor were all identified with the nation's records; while Charles Brockden Brown's novels, although they were read and quoted in England and indeed perceptibly influenced the Godwin and Shelley group of writers, are now universally pronounced to be hard to read and, though reprinted, are treated rather as historic monuments than as sources of pleasure. Still another remarkable memorial was Dennie's 'Portfolio,' a magazine whose editor, like Franklin, had migrated from Boston, although he was unlike Franklin a Harvard graduate. Dennie kept his magazine singularly in touch with the advanced literary training just taking place in England, quoted early poems by Coleridge, Wordsworth, and Leigh Hunt, and although he derided the new German literature, it was in the Kotzebue period, a period when there was hardly anything better to quote. His paper was in these respects the high-water mark of the Philadelphia culture of that day, while the low-water mark in that society must be judged from the fact that new books could there, as in the rest of the new commonwealths, be published only by subscription and scarcely ever as now, at the risk of book sellers; and also by the fact that the Loganian Library, the pioneer of all American libraries, was then opened only in the afternoon, when it became a sort of fashionable lounge.

The new government, ere long, removed itself to New York, where the American Republic was finally organized in 1789 and the first strictly original school of authors took the name of Knickerbocker School, and was organized or at least drawn together by Washington Irving and his friends. Diedrich Knickerbocker was the first imaginative creation in the history of our country and furnished very distinctly the opening of a notable career, soon temporarily transferred to the other hemisphere. Irving's later books were of a higher grade and, although he spent a large part of his life in Europe, he was essentially an American at heart. He worked in many fields and was only slightly and incidentally tempted into fiction. This field was first preoccupied in America by two or three women, such as Mrs. Foster and Mrs. Rowson, whose highly wrought and quite tragic books such as the 'Coquette' and 'Charlotte Temple' went through many editions and were translated into various languages. Cooper then came upon the field and surpassed all others in the popularity of his works into which he introduced, for the first time, certain really American types, such as Leatherstocking, the woodsman; Long Tom Coffin, the sailor; and Chingachgook, the Indian. He had obvious faults which he shared with his contemporary English rival, Sir Walter Scott, faults including unreasonably long first chapters and very loose-jointed plots. But he won without effort a wider international audience than has yet been secured by any other American writer, except Longfellow and Mrs. Stowe, each of these three reaching the limit of 30 or thereabouts in the variety of languages into which their books have been translated. No one can look over the catalogues of foreign book stores without seeing how remarkably this popularity has held its own, in the case of Cooper. Bryant, who is claimed with New York authors, belongs rather to Massachusetts where he was born and bred and where he drew from classic rural influences, even in his early youth, that high and delicate vein which seemed curiously inconsistent with his life as a hard-working journalist.

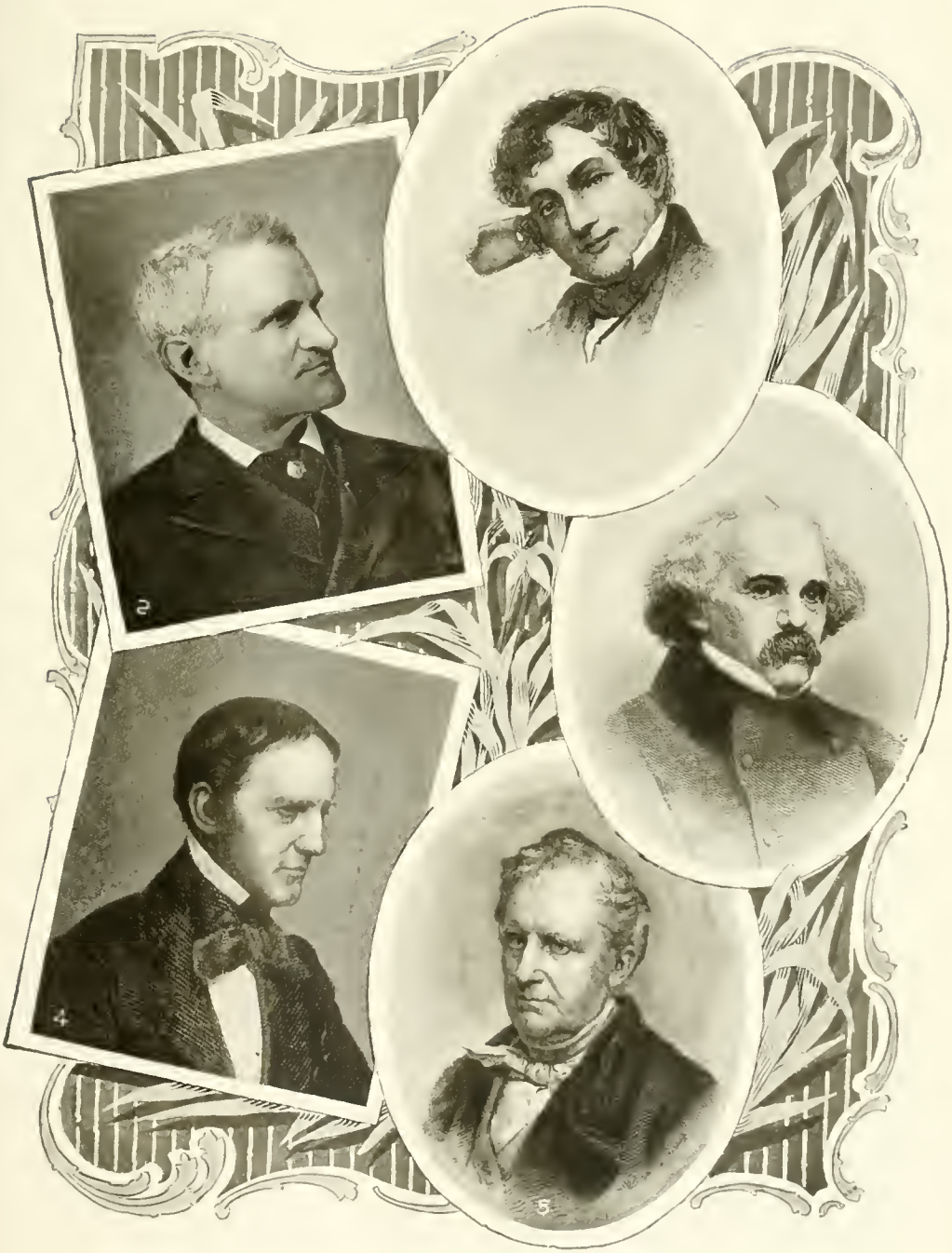
After the Philadelphia and New York periods, there came a marked outburst of intellectual activity which made Boston, instead of New York or Philadelphia, the temporary centre of American literary life. Such a group of authors as Channing, Emerson, Holmes, Longfellow, Lowell, Whittier, Thoreau, Parkman, and others had never before met in America. With these was developed a lecture system which spread itself all over the country, though the leading lecturers in almost all cases were, at first, from

the Atlantic shore. Most of these men found in the lecture field a temporary fame to which no permanent literary fame responded and the names of even the leading lecturers such as Gough, Chapin, Curtis, Whipple, Holland, and lesser men are now beginning to fade into oblivion. To them was to be added the strong force of Abolitionists, headed by Wendell Phillips and Frederick Douglass, whose remarkable powers drew to their audiences many who did not agree with them. Women like Lucretia Mott, Anna Dickinson, and Lucy Stone also joined the force. These lectures were a source of popular education; they were subject, however, to the limitation of being more suggestive than instructive, because they always came in a detached way and so did not favor coherent thinking. The much larger influence now exerted by courses of lectures in the leading cities does more to strengthen the habit of consecutive thought, and such courses, joined with the great improvement in public schools, are assisting much in the progress of public education. The leader who most distinguished himself in this last direction was, doubtless, Horace Mann. The influence of American colleges which are, in the older States, steadily maturing into universities, has made itself more and more obvious, especially as they have with startling suddenness and comprehensiveness extended themselves to women also, whether in the form of co-education or of institutions for women only. For many years, the higher training of Americans was obtained almost entirely by periods of study in Europe, especially in Germany. Men, of whom Everett, Ticknor, Cogswell, and Bancroft, were among the pioneers, beginning in 1818 or thereabouts, discovered that Germany and not England must be made our national model in this higher training; and this discovery was strengthened by the number of German refugees, highly educated men, who sought this country for political safety. The influence of German literature on the American mind was undoubtedly at its highest point half a century ago, and the passing away of the great group of German authors then visible was even more striking than have been the corresponding changes in England and America; but the leadership of Germany in scientific thought and invention has kept on increasing so that the mental tie between that nation and our own was perhaps never stronger than now.

In respect to literature, the great tendency to fiction everywhere visible has nowhere been more marked than in America. Since the days of Cooper and Mrs. Stowe, the recognized leader in this department has been Howells; that is, if we base leadership on higher standards than that of merely numerical comparison. The actual sale of copies in this department of literature has been greater in certain cases than the world has before seen, but it has rarely occurred that books thus copiously multiplied have taken very high stand in more deliberate criticism. In some cases, as in those of Bret Harte, an author has won fame in early life by the creation of a few remarkable characters, and has then gone on reproducing them without visible progress; and this is especially apt to be the case wherever British criticism comes in, this being naturally more impressed by a few interesting novelties than by anything deeper in the way of local coloring or the delineation, however profound, of what goes on daily in the world. In the case of Howells, the work has ultimately suffered, not from any outward conditions, but from the tendency of certain temperaments, like certain eyes, toward demanding more microscopic work as they grow older, so that they end in laboriously analyzing and painting the little, instead of grasping the large. Both the public taste and the more fastidious criticism seem to unite in preferring this author's earlier fiction to his later productions, although he has not gone so far in waywardness as his earlier champion, Mr. James; and it is to be noticed also that both these authors retain the power of disarming criticism, from time to time, by remarkable single efforts.

Meanwhile Mr. Crawford, without residing in America, keeps up his work, laying the scene in Italian life; and we have at home authors like Hamlin Garland, H. B. Fuller, Owen Wister, Winston Churchill, who may at any moment surprise us by doing something better than their very best. The same remark might yet more emphatically be made of Frank Norris and Stephen Crane, had not their period of work on earth prematurely ended. In calling over the names of these later American writers, it is quite worth noticing that leadership has not come to those who had been the greatest wanderers over the earth, but to those who led their lives, formed their style, and established their standards at home. The most cosmopolitan American writers of the last generation were probably Willis and Bayard Taylor, but their fame has proved, or is proving, insecure. On the other hand, the American names which one sees oftenest mentioned in European books — Emerson, Thoreau, Poe, Whitman — are those of authors who never visited Europe or under such circumstances as to mold but a trivial part of their career. We must always remember, moreover, what is true especially in works of fiction, that not only individual books, but whole schools of them emerge and disappear, like the flash of a revolving light; you must make the most of it while you have it. "The highways of literature are spread over," said Holmes, "with the shells of dead novels, each of which has been swallowed at a mouthful by the public, and is done with."

It was once wisely said that there never yet was a great migration which did not result in a new form of national genius. When, as in the case of America, the transplantation of a race brought men and women into a new atmosphere beneath a new sky, this result was necessarily more apparent. He who lands from Europe on our shores perceives a difference in the sky above his head, the height seems greater, the zenith father off, the horizon wall steeper. With this result on the one side, and the vast and constant mixture of races, on the other, there must inevitably be a change. No portion of our immigrant body desires to retain its national language; all races wish their children to learn the English language as soon as possible, yet no imported race wishes its children to take the British race, as such, for models. Our new-comers unconsciously say with that keen thinker, David Wasson, "The Englishman is undoubtedly a wholesome figure to the mental eye; but will not 20,000,000 copies of him do, for the present?" The Englishman's strong point is his vigorous insularity; that of the



1. Washington Irving. 2. Francis Parkman. 3. Nathaniel Hawthorne.
4. William H. Prescott. 5. J. Fenimore Cooper.

American his power of adaptation. Each of these attitudes has its perils. The Englishman stands firmly on his feet, but he who merely does that never advances. The American's disposition is to step forward even at the risk of a fall. Washington Irving, who, as we have seen, seemed at first to an acute French observer a mere reproduction of Pope and Addison, wrote to John Lothrop Motley two years before his own death, "You are properly sensible of the high calling of the American press — that rising tribunal before which the whole world is to be summoned, its history to be revised and rewritten, and the judgment of past ages to be cancelled or confirmed." For one who can look back 60 years to a time when the best literary periodical in America was called 'The Albion,' it is difficult to realize how the intellectual conditions of the two nations are changed. In many things which require thorough workmanship, England still remains the more thoroughly organized, as, for instance, in its roads and in its postal system, while in all that concerns the future conditions of a great continent, American enterprise is taking the lead. M. D. Conway once pointed out that the English magazines, such as the 'Contemporary Review' and the 'Fortnightly,' were simply circular letters addressed by a few cultivated gentlemen to the fellow members of their respective clubs. Where there is an American periodical, the most striking contribution may proceed from a previously unknown author and may turn out to have been addressed practically to all the world.

So far as the intellectual life of a nation exhibits itself in literature, England may always have one advantage over us — if advantage it be — that of possessing in London a recognized publishing centre, where authors, editors, and publishers are all brought together. In America, the conditions of our early political activity, have supplied us with a series of such centres, in a smaller way, beginning namely with Philadelphia, then changing to New York, then to Boston, and then reverting, in some degree, to New York again. I say "in some degree" because Washington has long been the political centre of the nation and tends more and more to occupy the same central position in respect to science, at least; while western cities, notably Chicago and San Francisco, tend steadily to become centres for the wide regions they represent. Meanwhile the vast activities of journalism; the readiness of communication everywhere; the detached position of colleges and many other influences decentralize literature more and more. Emerson used to say that Europe stretched to the Alleghanies, but this, at least, has been corrected and the national spirit is coming to claim the whole continent for its own. Mr. Howells, whatever his limitations, has at least contributed toward this great change and it has been said of him that his best scenes imply a dialogue between the Atlantic and Pacific slopes.

If there is, at present, in America a tendency to transfer its allegiance to science rather than literature, it is to be remembered that this phenomenon is not local, but general and extends also to all European nations. It was predicted in a manner by that curious atrophy of one side of the mind which took place in the great leader of modern science, Charles Darwin, who took in his youth intense delight in poetry, and read Shakespeare with supreme enjoyment, a kind of enjoyment which also extended to music and to plastic art. At the age of 67, however, he tells us with "great regret" that for many years he cannot endure to read a line of poetry, that Shakespeare nauseates him, and that he has lost almost all taste for pictures and music. There may be no need for this transformation, and it is probably only a swing of the pendulum; but its temporary influx has nowhere been better defined or characterized than by the late Clarence King, formerly director of the United States Geological Survey, who wrote thus a little before his death: "With all its novel modern powers and practical sense, I am forced to admit that the purely scientific brain is miserably mechanical; it seems to have become a splendid sort of self-directed machine, an incredible automaton, grinding on with its analyses or constructions. But for pure sentiment, for all that spontaneous, joyous Greek waywardness of fancy, for the temperature of passion and the subtler thrill of ideality, you might as well look to a wrought-iron derrick."

Whatever charges can be brought against the American people, no one has yet attributed to them any want of self-confidence or self-esteem, and though this trait may be sometimes unattractive, yet the philosophers agree that it is the only path to greatness. "The only nations which ever come to be called historic," says Tolstoi in his 'Anna Karénina,' "are those which recognize the importance and worth of their own institutions." Emerson, putting the thing more tersely, as is his wont, says that "No man can do anything well who does not think that what he does is the centre of the visible universe." The history of the American republic was really the most interesting in the universe from the outset, were it only from the mere fact that however small its scale, it yet showed a self governing people in a sense never before witnessed on the globe; and to this is now added the vaster contemplation of it as a nation of 70,000,000, rapidly growing. If there is no interest in the spectacle of such a nation, laboring with all its might to build up an advanced civilization, then there is nothing interesting on earth. The time will come, when all men will wonder not that Americans attached so much importance to their national development, but that they appreciated it so little. Canon Zincke has computed that in 1980, the English-speaking population of the globe will number, at the present rate of progress, 1,000,000,000, and that of this number 800,000,000 will dwell in the United States. No plans can be too far-seeing, no toils and sacrifices too great in establishing this vast future civilization. Take, for instance, the immense endowments of Mr. Carnegie which fulfill the generalization of the acute author of a late Scotch novel, 'The House with the Green Shutters,' who says that while the Scotchman has all the great essentials for commercial success, "his combinations are rarely Napoleonic until he becomes an American."

When one looks at the apparently uncertain, but really tentative steps taken by the trustees of the Carnegie Institution at Washington, one sees how much must yet lie before us in our provisions for intellectual progress. The growth of our common schools and universities is per-

haps as rapid as is healthy and the number of merely scientific societies is large, but the provision for the publication of works of research and literature is still far too small. The endowment of the Smithsonian Institution now extends most comprehensively over all the vast historical work, now so widely undertaken, and the Carnegie Institute bids fair to provide freely for purely scientific work and the publication of its results. But the far more difficult work of providing for pure literature is as yet hardly attempted. Our boasted magazines tend more and more to become mere picture books and our really creative authors are geographically scattered and, for the most part, poor. Professor Newcomb has just boldly pointed out that we have intellectually grown as a nation "from the high school of our Revolutionary ancestors to the college; from the college stage we have grown to the university stage. Now we have grown to a point where we need something beyond the university." He further suggests the need of an institution at Washington which will not merely encourage scientific research, but plan and organize it in advance. Yet what he aims to do for science is more needed in the walks of pure literature and is there incomparably more difficult, since it has to deal with that more subtle and higher form of mental action which culminates in Shakespeare instead of Newton. This high effort, which the French Academy alone even attempts, however it may fail in accomplishing the enterprise, may at least be kept before us as an ultimate aim in America. See AMERICAN LITERATURE; PERIODICAL LITERATURE.

THOMAS WENTWORTH HIGGINSON,
Author of 'History of the United States.'

58. United States — Economic Development of the. During the colonial period the population of the country was confined to a narrow strip of territory along the Atlantic coast. By the middle of the 18th century the river valleys had been settled, the pioneers had reached the barriers of the Appalachian mountains, and the region beyond this barrier had been penetrated only by a few hardy explorers. After 150 years of settlement the population had increased to 2,500,000 in 1770, of whom the vast majority were engaged in agricultural pursuits. The division of labor between different sections of the country was but slightly developed, and in large measure each family produced on its own land the chief articles of its consumption. Indian corn, an indigenous product, had proved itself the most valuable crop because of the quick returns from newly cleared land and its utility as food for man and feed for cattle. Another indigenous product, tobacco, formed the basis of the earliest export trade, and with rice and indigo and laid the foundation of the economic growth of the Southern Seaboard States. The surplus products of the Northern States as population and production increased, found their chief market in the West Indies, flour and provisions from the Middle States and fish and naval stores from New England. These exports formed the means of payment for the imports of manufactured goods which were drawn chiefly from England. Certain manufactures were carried on at home, but these were almost without exception the cruder forms, furnishing such goods as could not have been imported in any case. Very little change took place in the quarter century following the achievement of independence. Population grew rapidly till it reached over 5,000,000 in 1800, and production increased correspondingly, but it was production along the old lines with little advance in the direction of the new industrial development which was already of importance in England. In the South the cultivation of tobacco, indigo and rice still flourished, but was beginning to give way before the expanding cotton culture which was destined to fix the economic and social character of that region. Slavery had been introduced at an early date, and owed its growth to the economic need for a large labor class, and the adaptability of slave labor to the cultivation of the peculiar products of southern soil. The invention of the cotton gin in 1793 was destined to make cotton the southern staple, and the consequent greatly increased demand for labor was bound to establish slavery on a firm basis for years to come. Cotton cultivation under a system of slave labor could best be carried out on large estates, and the character of the southern gentry also aided to establish the great plantation system of land holding which so markedly distinguished the South from the rest of the country.

In the North small holdings with diversity of agriculture prevailed. Food products were grown both for the home market and for export. The West Indian market still continued to be the most important. The greatest commercial activity was found in New England, where the fishing industry provided an immediate source of export trade, and where the shipping industry and carrying trade were especially stimulated by the opportunities afforded to neutrals during the period of the European wars. Domestic manufactures were in a flourishing condition, but little advance had been made in the introduction of mechanical processes, while the factory system was nearly unknown. There was little to encourage capital to compete with the powerful industries of England, especially while the opportunities for its employment in agriculture and shipping were so attractive. In the meantime, the movement toward the settlement of the West, which was to be a controlling factor in the economic development of the country, had begun. By 1800, about one tenth of the population had moved west of the mountains into western New York and western Virginia, but especially into Kentucky and Tennessee, a movement which began the settlement of the Ohio valley. For the time being, however, this population was practically shut off from close commercial connection with the older settlements. The movement, however, continued rapidly year by year. The situation, then, during the first 20 years after the adoption of the constitution, was that of considerable widespread comfort, leading to rapid increase in population (about 35 per cent to the decade), but with no very marked changes in the line of progress in methods or a more complicated organization of industry.

The War of 1812 marks the beginning of an important change. From this time on, changes of a more radical nature took place, leading to a much greater diversification of industry and a more complicated territorial division of labor.

The causes of this change were the rise of manufactures, the great improvements in transportation methods, and the extension of agriculture in the Middle West and of cotton culture in the new southwestern States. At the same time a national economic policy took shape which aimed to stimulate all of these factors. The practical cessation of foreign trade in the years 1808 and 1809, and again at the time of the war, forced the nation into a more rapid industrial development, which led to the adoption of the factory system and production on a larger scale. The development was so marked that at the close of the war in 1815 the industrial situation was completely changed. Many new industries had been established and a large amount of capital had been invested. The new industries were brought at once into competition with the older industries of Great Britain, and the natural result was a demand for tariff protection. The principle of protection had already been firmly established, but the act of 1816, providing especially for the protection of the new textile industries, marks the beginning of a new and more energetic policy in this direction.

In the meantime the settlement of the Ohio valley continued. Soon after the close of the war the population west of the mountains had reached a total of 2,000,000, the settled area including, besides Kentucky and Tennessee, a large part of Ohio, and the southern parts of Indiana and Illinois. This population was confined largely to the territories immediately adjacent to the important rivers, but constituted, on the whole, a wedge of settlement extending from Lake Erie to the Tennessee on the east, and following roughly the valley of the Ohio westward to its junction with the Mississippi. The extraordinary foreign demand for cotton greatly stimulated the settlement of the Southern States. The total production of cotton in the United States in 1790 was only 1,500,000 pounds. By 1810, however, this was increased to 85,000,000 pounds. Down to this time production had been confined practically to the Atlantic States. In the next decade the cultivation of cotton was rapidly extended, and with it of course the slave system with which it was bound up, until by 1820 the river valleys of Alabama, Louisiana and Mississippi were already well settled. The agricultural states of the West were, however, at this time almost completely separated, for commercial purposes, from the Eastern States, which were rapidly increasing along industrial lines. The traders from the Eastern States were able to carry goods across the mountains and down the valleys, but it was practically impossible for the agricultural products of the West to find a market in the East, because of the tremendous difficulties of transportation. The further development of the West would have been seriously hindered had it not been for the division of labor between the two sections. For the Southwest the all-important product was cotton, and this fact made these States dependent to a large extent on the States of the Ohio valley for corn and provisions, and this furnished a good outlet for the superfluous products which were shut out from the East by the impassibility of the mountains.

The problem of transportation was at this time the most critical economic problem. Except for a few turnpikes in the most thickly settled regions, the roads were in most wretched condition, and from an early date agitation had arisen in favor of public improvement of highways and the establishment of a network of canals to supplement them. The immediate need was to secure such a system as would unite the traffic of the eastern river districts, connect eastern rivers with those west of the mountains, and bring the agricultural regions of the Western States into closer connection with their own natural waterways. For the time being, the chief hope of further material expansion seemed to lie in the rapid development of such a system of canals, and enterprises of considerable moment were undertaken during these years. Such enterprises demanded a far larger capital than could be secured in the home markets and extensive borrowing in England became necessary, which was only possible by the issue of State bonds in support of these internal improvements; and the contributions of the State governments were, in view of the resources of the time, not only large, but, as the result proved, frequently reckless. The most important of the canal undertakings was the construction of the Erie Canal (see CANALS), connecting Lake Erie with the Hudson River, and opened the eastern markets to northern Ohio. But the great body of settlers were still too far south to make connection with this route practicable. Of more importance for these sections was the introduction of steam navigation on the Ohio. The first attempt in this direction was in 1811, but it was not until several years later that steam navigation on the western rivers became commercially important. This great improvement in transportation, combined with the opening of the southwestern market to western products, greatly stimulated the development of this section. Towns along the Ohio and Mississippi flourished as never before. Pittsburg became the distributing centre for merchandise to the west, and New Orleans the great receiving port for western provisions whether for home consumption or export.

Despite the great prosperity of the country as a whole, the different sections could, however, not be bound together into a strong national unit until the three sections, the Southern, the Western, and the North Atlantic States, could be united by closer commercial interests than had hitherto been the case. The most important factor in bringing about these closer relations was the introduction of the railroad. It is not necessary to enlarge upon the great importance of the commercial revolution brought about everywhere in the world by this invention. Several specially important results for the United States, however, are noteworthy. The great extent of territory already settled compared with the total population and capital facilities made further development hang almost entirely upon improvements in transportation. Furthermore, the railroad first made it possible to utilize to the full extent the fertile territory and was a most important influence in causing the settlement of regions lying between and away from the great water-courses. It also solved the problem of the commercial separation of the East and West, and united these two sections of the

country in a way which could never have been possible under a system of canals. From the time that railroads were fully extended into the west to the present, the chief routes of commerce have been east and west rather than north and south. Finally, the railroad in this country has been the chief means of further expansion of the population and the development of commerce in unsettled regions. In the West the rails have frequently been laid first through vast unsettled tracts and the settlers been enabled to enter only because of these new facilities. It is this fact which made possible the development of the trans-Mississippi region. The first railroad to be opened was the Baltimore and Ohio, the first rail of which was laid in 1828. The idea of the road was to unite the sea coast with the Ohio River, but it was not until 1853 that the Ohio was finally reached. In the first 20 years, railroad development was confined chiefly to the Atlantic States, and as formerly in the case of canals, so now extraordinary advances were made by the State governments for the extension of this new form of internal improvements. Some beginnings were made in the forties toward the extension of railroads in the Western States, and this movement became increasingly important down to 1860. In 1850 the total mileage was 9,021 miles and in 1860 30,626.

The period from 1840 to 1860 is the period of the settlement of the Mississippi valley above the corn belt, as the two decades before had been especially marked by the settlement of the southwestern cotton States, and the first two decades of the century by the settlement of the Ohio valley. From 1840 to 1860 the population of Illinois and Indiana more than doubled, and the population of Michigan and Wisconsin increased from 333,000 to 1,500,000, while the west bank of the Mississippi was settled from North to South. Among the important causes tending to this expansion, besides the improved methods of transportation, were, in the first place, improvements in methods of agricultural production, especially the application of a reaper of an improved pattern to farming on a large scale. Important improvements have been made since this period in such machinery, but all the main inventions had been made before 1860 and the reaper had come into general use. The second factor in increasing the rapidity of settlement was the policy of the government regarding the public lands. The early theory regarding government domain was that it should be used as a vast property for fiscal purposes, and the change to a more liberal policy was largely due to the popular demand for land, and showed the growing influence of the West. As early as 1820 the minimum unit of purchase had been reduced to 80 acres, and the price to $1.25 per acre. By 1841 a permanent pre-emption act was passed and the principle firmly established that public lands were to be opened freely to the agricultural settlers, on the ground that the strength of the State would be much more increased by the rapid expansion of a prosperous population than by the utilization of so important a government asset primarily as a source of revenue. This policy was carried to a conclusion by the adoption of the Homestead Act in 1863. The area of improved farm land increased by 50 per cent between 1850 and 1860, and the value of farm property by one hundred per cent. The increase of an industrial population in the Eastern States afforded a constantly expanding market for the new products, while in 1846 the markets of England were thrown open by the repeal of the Corn Laws. This was the beginning of a steady foreign market for American food, but down to the Civil War the exports, save in exceptional years, were not great, and with the exception of cotton and tobacco Europe took, in normal years, a smaller quantity of American products than the non-European countries. At the same time the demand for cotton continued to increase until the cotton belt, by 1860, had spread so far west that Texas already had a population of 600,000, and the production of cotton had increased by that year to 2,200,000,000 pounds, nearly three times the production of 1840. Of this great production 75 per cent still continued to be exported. This continued expansion of cotton culture was the chief cause of the firm establishment of the slave system, and despite its great effects on material prosperity, was the fundamental cause in bringing about the strained situation which seemed likely to cause a political disruption. In the meantime, however, the movement in the West had begun, which was to be of great importance in bringing the West and East together. Gold was discovered in California in 1849, and within ten years the rush of settlers had given a population to that State of 350,000. Had it not been for this settlement, due to the eager search for gold, the region beyond the arable lands would probably have remained an unsettled frontier for a much longer period than was actually the case. The development of a large community on the Pacific slope led to the building of the transcontinental railroads and the elimination of an unsettled area in a surprisingly short time.

The period of the Civil War naturally caused a severe interruption to this continued material progress, and retarded the development of the Southern States immeasurably. On the whole, however, the Northern States came through that struggle with surprisingly slight economic loss, and throughout the struggle increased their population, their area of settlement, and their total production. The period after the Civil War is marked by important changes. In fact, the Civil War was almost as much of a turning point in the economic life of the country as in its political life. The question of national unity, which had been settled as a political theory, was to be settled even more effectively by an economic development which was to bring all sections of the country into much closer commercial relations.

The two most striking features of the development for 30 years after the war were the rise of the United States to a position of chief source of food products for Europe on the one hand, and on the other, its growing independence of Europe in the matter of manufactures, due to the extraordinary development of home industries. The most important factor in this development lay in the unparalleled command of natural resources. The area of the United States at the close of the Civil War was 3,025,000 square miles. Stretching across the con-

AMERICAN MEN OF PROGRESS.

From an engraving published by the Scientific American in 1861.

JAS. BOGARDUS. Iron buildings.
SAMUEL COLT. Fire arms.
JOSEPH SAXTON. Fine machinery.
PETER COOPER. Organizing of manufacture.
PROF. HENRY. Electro magnetism.
JOHN ERICSSON. Marine engineering.
S. F. B. MORSE. Telegraph.
RICHARD HOE. Rotary press.
ERASTUS BIGELOW. Carpet loom.
THOS. BLANCHARD. Eccentric lathe.

DR. MORTON. Anæsthesia.
C. H. McCORMICK. Harvesting machinery.
CHARLES GOODYEAR. Vulcanized rubber.
J. L. MOTT. Iron work.
DR. NOTT. Heating of buildings.
F. E. SICKLES. Steam engines.
HENRY BURDEN. Iron working.
JENNINGS. Friction matches.
ELIAS HOWE. Sewing machine.

tinent, it commands access to two great oceans. Its eastern coast line, indented with frequent harbors, stretches south until it meets the great southern Gulf, which then extends beyond the mouth of the Mississippi to the cotton fields of Texas. To the north, the Great Lakes, connected with the Atlantic seaboard by the St. Lawrence and the Erie Canal, reach the wheat fields and iron supplies of the West. One third of the way across the continent, and in the very middle of its most fertile region, the great Mississippi flows from the Canadian border to the Gulf, and into this river flow vast tributaries from both east and west, forming a single valley which extends for 1,800 miles at its widest part, and includes more than half the arable land of the country. Within the area thus situated is to be found a marvelous variety of climate, soil, and mineral resources. From the arid plains to the Alleghany Mountains stretch three great belts of arable land, distinguished by their chief crops into the spring wheat belt in the north, the central belt of winter wheat and corn, and the southern cotton belt. Beyond this fertile territory lie the plains which are the seats of vast cattle and sheep ranches, while the mountain States are rich in valuable ores, gold, silver and copper. Beyond these lie the fertile States of the Pacific, with their lumber, wheat and fruits. Coal and iron, the most important minerals for industrial development, are widely distributed within the great belts of arable territory already described, throughout the Alleghany region, and even further east. In the period after the war all these regions were rapidly connected by an extensive network of railroads. At the close of the war the railroad mileage of the country was 35,000 miles. Within four years from the close of the war the first great transcontinental line was completed, and the Atlantic and Pacific at last united. In the meantime, rapid building continued in all sections of the country, and by 1870 the mileage had increased to 52,000 miles, by 1880 to 93,000, and by 1890 to 166,000. This continuous expansion of transportation facilities brought new areas into cultivation, opened up new supplies of raw materials, and built up a market in the West for the products of the East.

Between 1860 and 1870 the population of the grain States increased by more than 42 per cent and the next decade by nearly 34 per cent, a total addition in 20 years of over 8,000,000 inhabitants. The production of cereals and the accompanying production of provisions increased correspondingly. The wheat crop, which in 1870 had amounted to 235,000,000 bushels, had doubled in 1890, and since then has twice exceeded 600,000,000 bushels, and once 700,000,000 bushels. The corn crop has increased from an average of about 1,000,000,000 bushels in 1875, to an average of over 2,000,000,000 bushels in recent years. The value of the meat packing industries, dependent upon this great corn crop, increased from $75,000,000 in 1870 to $561,000,000 in 1890. Exports increased in even greater proportion than production. The annual average export of wheat, including flour, from 1867 to 1872 was 35,500,000 bushels; from 1873 to 1878 it was 73,400,000 bushels; from 1879 to 1883, 157,000,000 bushels. Such an increase could not continue indefinitely, especially in view of the increasing home demand, and in the next decade exports fell off slightly, but in recent years they have increased to a higher figure than ever. The export of corn is of relatively less importance. It is primarily the feed crop for the home market, and eighty per cent of the total crop, which in bushels is three or four times that of wheat, is consumed in the county where grown. In recent years, however, the exports have increased enormously, and now in bushels are as great as the export of wheat. In the matter of provisions, the exports increased from 1870 to 1890, for fresh beef, from 20,000,000 pounds to 200,000,000; for bacon and hams from $6,000,000 to $60,000,000; for lard from $6,000 to $42,000,000.

Despite this growth of exports, an important cause for the agricultural development was the continually expanding home market in the industrial States. The primary cause for this industrial expansion may also be said to lie in the natural advantages noted above. The people possessed of these advantages have, however, shown themselves peculiarly fitted for their utilization; the energetic and practical character of the American fits him for success in any economic field, but his peculiar aptitude for invention and the use of machinery guarantees especial success in the line of manufactures. Inventions have been stimulated by an admirable system of patents, and the number of new inventions annually patented in this country is far in excess of that in any other country in the world. Added to these natural advantages of resources and character was the special stimulus given to the expansion of manufactures by the system of high protection adopted at the time of the war, and consistently maintained ever since. Whatever may be the ultimate effects of such a policy, it cannot be doubted but that the rise of manufactures has been in many if not all lines more rapid than it would have been without such a national policy. The present protective tariff really originated in the high duties imposed for revenue purposes at the time of the Civil War, and which were maintained in time of peace because of the stimulus which they had already given to manufacturers, who successfully urged the necessity of maintaining these high rates to prevent a decay of industry from competition with manufacturers producing with cheaper costs of production abroad. A further aid to the development of manufactures was the large stream of immigration (see IMMIGRATION TO THE U. S.) which began about 1845 and increased after the Civil War. All told, over 20,000,000 immigrants have come into the country since 1845, and in 1900 the ratio of foreign born to the whole population was 13.7 per cent, in actual number 10,460,085, while all those born of foreign parents constituted 34.3 per cent of the total, or about 26,000,000. It has been a popular idea that this large immigration was primarily due to the possibility of taking up free land in the West, but statistics show that the progress of settlement has been primarily a native movement while the immigrants have filled the positions in mines, factories and construction undertakings. To be sure, certain farming sections have been settled by special nationalities, but even of the Germans only

25 per cent have taken to the land, and of the Irish only 12 per cent. The chief incentive to immigration has been the opportunity for employment afforded by the great industrial development in the last forty years, and the extension of our railroads, the exploitation of our coal fields and the rise of our factories have all been made more rapid by this influx of cheap labor. Immigration, however, has brought some serious evils in its train. So far as the foreign elements were distributed among the native population or where they took to the land they have become assimilated to the native stock and have formed a sober and industrious element of the population. Where, however, they have been concentrated in manufacturing and mining centres they have frequently remained unaffected by the national ideal of democratic equality based on an enlightened obedience to law. The situation is made even worse by the fact that the character of the immigration has changed in recent years. Formerly the immigrants were chiefly of the sturdy races of northern and western Europe, while to-day a large majority come from the less advanced races of the south and east. However, it is not immigration alone which has introduced problems into our society which are inconsistent with the earlier democratic theories. The great rise of industrialism has been possible only through the extension of production on a colossal scale and the consequently increased dominance of a capitalistic class. The earlier artisan had always an escape to the land, which tended to strengthen his position socially and economically. To-day a great and permanent wage-earning class is the characteristic feature of industrial society.

It is impossible here to enter into a discussion of the problems involved in the changed conditions of "labor and capital." It is well, however, not to forget that these problems are the natural results of an economic growth which has increased enormously the production of wealth and raised the United States to the first rank among industrial and commercial nations. Thirty years after the Civil War the United States had come to a position where they were able both to furnish enormous supplies of food products and raw materials to Europe and at the same time supply most of the home demand for manufactured goods from their own factories. From 1860 to 1890 the capital invested in manufactures increased from $1,000,000,000 to nearly $10,000,000,000; the output of products increased from less than $2,000,000,000 to over $13,000,000,000, and the wage-earners from 1,311,000 to 5,315,000.

The extraordinary economic position of the United States can be seen best, however, from still later statistics, for the seven years from 1897 to 1904 mark the beginning of a new departure. The great prosperity since the end of the depression which followed on the panic of 1893 has been sufficient to establish both the agricultural and industrial supremacy of this country among all nations, and at the same time has raised it to be a leading factor in the export markets for manufactures. Before the Civil War it was the general opinion that this country must of necessity be primarily an agricultural country and that our foreign trade would consist of an exchange of food and raw material for manufactured products. The industrial development in the 30 years after the war made us less and less dependent on foreign manufacturers, and made possible an internal trade of greater importance, compared with the foreign trade, than that of any other country of the first rank. The new era ushered in by the recent period of prosperity promises to be one in which the United States will become more and more an importer of raw materials and food and an exporter of manufactures. In the matter of manufactured exports our trade increased three-fold in a decade. In the three years from 1890 to 1892 the exports of manufactures were $470,000,000, and in the three years 1900–1902, $1,250,000,000. The exports of iron and steel rose from $27,000,000 in 1892 to $120,000,000 in 1901. The proportion of manufactured exports to total exports rose from 17.87 per cent in 1890 to 31.65 per cent in 1900. See Exports and Imports, American.

Turning to the side of imports it appears that at present scarcely more than 25 per cent of the total imports consist of manufactured goods ready for consumption. The former heavy imports of woolens, silks, and iron and steel products have greatly decreased, and of the chief articles of such imports during recent decades cotton goods alone seem to hold their own. In the case of iron and steel we have imported less than $20,000,000 on an average in the five years, 1899 to 1904, while average exports have been over $100,000,000. On the other hand, the imports of food products and materials for manufacture have greatly increased. The most important items of import are now coffee, sugar, india-rubber and gutta-percha, hides and skins, raw silk, and the like. The actual proportions in 1901 were as follows: Food products and animals, 27.02 per cent; raw materials, 32.79 per cent; partially manufactured, 9.61 per cent; ready for consumption, 30.58 per cent.

Such figures are significant of an important change in the character of our trade. Agricultural exports, however, still hold their pre-eminence. Despite the increased consumption at home, the exports of breadstuffs, provisions and cotton have steadily grown. We still export two thirds of our cotton crop, in 1901 over 3,500,000,000 pounds, about 80 per cent of the world's supply. Out of a crop of 748,000,000 bushels of wheat, 290,000,000 were exported. In values the exports of cotton were $300,000,000, of breadstuffs $276,000,000 and of provisions $207,000,000, making a total of $783,000,000 for these three items alone. More important than the foreign market, however, is the home market, with the exception of cotton, of which the exports are two thirds of the total crop. The exports of wheat are one third, but of corn the exports are only 10 per cent and the great feed crops, corn, oats and hay, are more important to farmers as a whole than wheat. The money value of the dairy products annually produced in this country is greater than that of the wheat crop, and the value of the poultry and eggs greater than that of the gold, silver and copper combined. The home market is still more pre-eminent in the case of manufactures. The consumption of cotton by American mills is already greater than by the English mills; the manufacture of silks has increased to over

$100,000,000 in value of the annual product. The production of pig-iron has increased 90 per cent since 1897 and reached 17,000,000 tons in 1901, while steel was produced to the amount of 15,000,000 tons, the product in both cases being greater than the combined output of Great Britain and Germany. All these great lines of manufacture find their chief market at home.

The above facts show the extraordinary economic independence of the United States, due to our combination of vast and varied resources and skilful and intelligent labor. In the matter of raw materials the country has ample supplies of food products for its own consumption and a great surplus for export; it has an ample supply of cotton and in a less measure of wool for its clothing; of coal, iron, copper and lumber for building and manufactures. It imports less than 5 per cent of its consumption of iron and steel, less than 10 per cent of its cottons and woolens, and less than 20 per cent of its silks. Its chief dependence for outside supplies for single important commodities is on the non-European countries for its coffee, tea and sugar, its hides and furs, its silk, fibres and rubber, its tin, and, to some extent, its wool. Though many of these are important for our manufactures, none of them are absolute necessities of life. No other great civilized race is able to produce so completely within their own borders the goods which they need. See POPULATION; U. S.— THE PEOPLING OF THE.

Bibliography.— The above article is based on a chapter by the author on the Economic Development of the United States, contributed to the 'Cambridge Modern History,' Vol. VII., 'The United States' ch. 22), which may be consulted for a more complete bibliography. Much valuable material will also be found in the general histories, especially those of Henry Adams, MacMaster and Rhodes. Other general works are: Bolles, A. S., 'Industrial History of the United States,' 1878; Depew, C. (editor), 'One Hundred Years of American Commerce,' 2 vols., 1896; Gannett, H., 'Building of a Nation,' 1895; Shaler, N. S. (editor), 'The United States of America,' 2 vols., 1894; Wells, D. A., 'Recent Economic Changes,' 1889; Woolsey, T. D. (editor), 'First Century of the Republic,' 1876; Report of the Industrial Commission, 1900–1902, 19 vols. The reports of the various departments of the government contain a vast amount of material, but are too numerous to be cited at length. For statistics of commerce and industry see especially the United States Census, taken each decade, the Statistical Abstract, Bureau of Statistics, annual, and the Monthly Summary of Commerce and Finance. On early conditions see: Coxe, T., 'View of the United States of America,' 1794; De Bow, J. D. B., 'Industrial Resources of the South and West,' 3 vols., 1853; 'Eighty Years' Progress,' Hartford, 1867; Pitkin, T., 'Statistical View of the Commerce of the United States,' 1817 and 1835. Seybert, A., 'Statistical Annals,' 1818; 'Nile's Weekly Register' and 'Nile's National Register,' 73 vols., 1811–48; Hunt's 'Merchants' Magazine,' 63 vols., 1840–70; 'De Bow's Review,' 40 vols., 1846–70. On the special subjects see: Donaldson, T., 'The Public Domain,' 1881; Turner, F. J., 'The Significance of the Frontier in American History' (American Historical Association, 1893); Bishop, J. L., 'History of American Manufactures,' 3 vols., 3d ed., 1868; Swank, D. M., 'History of the Manufacture of Iron in All Ages,' 2d ed., 1892; Wright, C. D., 'Industrial Evolution of the United States,' 1895; Taussig, F. W., 'Tariff History of the United States,' 4th ed., 1898; Rabbeno, U., 'American Commercial Policy,' 1895; Ringwalt, J. L., 'Development of Transportation Systems in the United States,' 1888; Hadley, A. T., 'Railroad Transportation,' 1885; Hammond, M. B., 'The Cotton Industry' (American Economic Association), 1897; Mayo-Smith, R., 'Emigration and Immigration,' 1890; Ely R. T., 'The Labor Movement in America,' 1886; Levasseur, E., 'The American Workman,' 1901.

HENRY C. EMERY,
Professor of Political Economy, Yale University.

59. United States — Commercial Development of. The commerce of the American colonies during the 17th and 18th centuries was chiefly with the mother country and the West Indies, the former being promoted by the intermittently enforced Navigation Acts (1651, 1660, 1663); the latter in a measure in spite of them. Three-fourths of the trade with England was carried on, principally in English ships, with the southern colonies, who received manufactured and forwarded goods — clothing, implements, wines and spices — in exchange for rice, indigo, tobacco, corn, naval stores and some cotton. The central and northern colonies sent to the mother country only a limited amount of products, but these covered a wide range;— lumber, masts, hides, and furs, ships, grains, fish, pot and pearl ashes, and some flour, cattle, butter and cheese. The chief trade of the New England and central colonies was with the West Indies, three-fourths of the shipping engaged belonging to New England; flour, lumber, fish, animals and dairy products being traded for the products, chiefly molasses, of the islands. An important field of trade was offered by the "Triangular Route," New England ships trading rum on the African coast for negroes, which were in turn traded in the southern colonies and the islands for molasses, this raw material being carried to New England and converted into more rum for further trade. There was a small trade with the Continent, fish, lumber and fur hats, for instance, being sent to Spain and Portugal in exchange for wines, brandy, tea, coffee and spices. At the outbreak of the Revolution the imports of the colonies amounted to approximately $20,000,000, and the exports to $11,000,000.

1790–1814.—With union and political strength came commercial strength. The first 25 years of union constitute a period of commercial advancement, characterized by great fluctuations, and by the predominant influence each upon the other of international politics and commerce. Other influences, more fundamental though less conspicuous, were present. The settled area doubled to nearly 500,000 square miles; population increased from less than 4,000,000 to over 9,000,000; the density of population on that area from 16.4 to about 18 per square mile. The most noteworthy extensions of production were of cotton and tobacco in the South and wheat in the Ohio Valley. But during this period commerce did not increase proportionately with settlement and production, the facilities for transportation,

little improved, being so poor as to hinder the movement of surpluses. A few canals were dug, and a flatboat trade was developed on the Ohio and Mississippi, but goods could be carried only at high rates; the freight rate from Louisville to New Orleans in 1812 was over $60 per ton. This period, characterized by the influence on commerce of international politics, may be divided into two periods distinguished from each other by the opposite effects of opposite political conditions. During the European wars and until the Embargo of 1807, the United States remained neutral and profited greatly. Not only was she called upon to supply goods, but the carrying trade of the world fell into her hands, and re-exports came to make up half of her exports. In 1789 the tonnage of American vessels in foreign trade was 123,893; in 1807, 848,306 tons. The total foreign trade reached for the years 1805, 1806, and 1807 an average of $231,000,000, the effects of the Orders in Council and the Berlin and Milan Decrees not being immediately felt. Their destructive effects, the Embargo of 1808 and the War of 1812 gave character to the second of the minor periods: American ships were seized and condemned, foreign freight fell off, the cotton, tobacco and wheat crops remained unsold, and the commerce of the United States decreased to $20,000,000 in 1814. During the more favorable part of this period, to the former trade with Great Britain and the West Indies was added a direct trade with the Mediterranean countries, with Germany, Sweden, and Russia, and with China and the East Indies. Clothing and implements remained the important articles of import from the Continent; sugar, silk, tea, and spices from the Orient. The exports continued to be predominantly agricultural, varying little from 80 per cent of the increasing total. Manufactures represented from 7 per cent to 9 per cent, forest products 7 per cent, fishery products 3 per cent to 4 per cent. Cotton had changed from an insignificant to an important item of trade, the production having increased from 3,000 bales in 1790 to 177,000 bales in 1819, and increasing amounts of flour were sent to feed the armies in the Peninsular and other wars. Manufactures were represented in foreign trade by such articles as candles, pot and pearl ashes, gun powder, spirits, flax and hemp, boots and shoes, tobacco, furniture and other manufactures of wood, and some pig and bar iron and nails.

1815–1865.— During the half-century following the Treaty of Ghent (see GHENT, TREATY OF) commerce trebled, imports increasing from an average of $113,000,000 for the five years 1815–1819 to an average of $321,000,000 for the five years preceding the Civil War, and the exports from an average of $77,000,000 to an average of $296,000,000. Fluctuations caused by wars, depressions, panics and tariffs are conspicuous and noteworthy, but the fundamental force to which may be attributed this remarkable development was the expansion of the settled area with its increasing density, the increased production in old and the opening up of new resources, and the establishment of communication between formerly isolated regions and the coast by the building of railroads and canals. The settled area extended westward into the great plains and increased by 1865 to over 1,000,000 square miles; the population reached over 30,000,000 and its density on the settled area over 26 per square mile. The rich cereal soils from western New York to the Mississippi, the cotton soils from Virginia to Texas, the animal resources of the Ohio and Mississippi valleys, the white pine regions from Maine to Minnesota, the hard wood regions to the south and the mines of the Pacific coast began to yield surpluses for export, increasing at the same time the power to command the commodities of other lands. By 1860 the production of wheat was 173,000,000 bushels, corn 867,000,000 bushels, cotton 4,000,000 bales and of gold $50,000,000, while the exports of wheat and flour reached nearly 35,000,000 bushels, and of cotton over 3,000,000 bales. Those exports with agriculture as their source continued to predominate, their proportion of the total still varying little from 80 per cent. Although the development of mineral resources was well under way, their products were absorbed in the domestic market, and their contribution to exports was small, while the exports of forestry and fishery industries decreased to 3.2 per cent and 1.3 per cent respectively. The value of manufactures produced in 1860 was nearly $2,000,000,000 and the proportion of exports from that source increased from 6.16 per cent in 1815 to 12.59 per cent in 1860. To the articles enumerated of manufacture for the preceding period the most important articles added were manufactures of bricks, cement, cars, carriages, copper, brass, rubber goods, leather goods, paper, soap and wearing apparel, while the contributions of tobacco, iron and steel and cotton manufactures increased to $3,383,428, $5,870,114, and $19,934,796 respectively. The exploitation of new resources, and especially their influence upon commerce, would not have been so marked had it not been for the great development of means of communication, highways, railroads, and canals. The Erie Canal, opened in 1825, gave an outlet to the east for the grain of the middle west, and soon freight rates between Ohio and New York were lowered 90 per cent. The shipments of wheat from Chicago increased from 78 bushels in 1838 to over 9,000,000 bushels in 1856 and nearly 16,000,000 bushels in 1860. By 1830 railroad building was under way, the mileage increasing from 23 in that year to over 35,000 in 1865, the Erie Canal being paralleled at the end of the period by railroads connecting the Mississippi Valley with New York and Boston. This made possible a segregation of traffic; by 1860, while 96 per cent of the grain from Chicago was sent by water, 65 per cent of the flour was sent by rail. In 1838 regular lines of steamers began shipments across the Atlantic, but their part in facilitating commerce did not become important until the end of the period. The direct influence of tariff (see U. S.—TARIFF IN THE) policy on commerce was slight; its significant influences were the indirect ones, to appear in the next period, when the policy bore its fruit in an increase of the volume and range of manufactures. On the whole, the tariffs of 1816, 1824, 1828, and 1842 decreased imports, which reacted slightly on exports, and affected unfavorably the rate of increase of international trade, while the tariffs of 1832 and 1846, lowering the preceding tariffs, had an opposite effect. Important commercial treaties with Great Britain (1818, 1830, 1854), France (1822, 1831), and most of the other continental countries; with

Mexico and the Central and South American countries; and with Siam (1833), China (1844, 1858), and Japan (1854) removed obstacles to trade. It was also increased by the European wars and famines, and diminished by the panics of 1837 and 1857. The Civil War stopped industry in the South, and with it the commerce of that section of the country; on the other hand, although it deranged business in the North, before its close it had, both directly and indirectly through high tariffs, stimulated agriculture and manufacturing, and the commerce of that section suffered comparatively slight diminution. The change between 1860 and 1865, for the entire United States, is indicated as follows: Imports $362,166,254 to $258,555,652; exports, $490,122,296 to $355,857,344. While American shipping ceased to enjoy in international trade the abnormally favorable conditions of the preceding period and suffered from the War of 1812 and the re-establishment of European shipping, it experienced an absolute increase, and the tonnage of American vessels registered in foreign trade increased from 984,269 tons in 1810 to 2,642,628 tons in 1861. The proportion, however, of imports and exports carried in American bottoms declined, the former from 94.2 per cent in 1830 to 60 per cent in 1860, and the latter from 86.5 per cent to 70 per cent. This proportional decrease was due to normal competition, to the advantages possessed by Great Britain as iron was substituted for wood in ship construction, and to the injury done American shipping by the Civil War. The decrease in tonnage carried in American vessels during the war was from 66.5 per cent in 1860 to 28 per cent in 1865. The number of treaties established during the period suggests an expansion of trade along many courses. In every direction there was an absolute increase both of imports and exports, although in some courses there were relative declines, as indicated by the following table:

INCREASE OF IMPORTS AND EXPORTS, 1830 TO 1860.

		Imports.	Per cent of total	Exports	Per cent of total
Europe	1830	$ 40,841,420	57.63	$ 48,175,248	65.24
	1860	216,831,353	59.87	310,272,818	77.54
North America	1830	17,548,892	24.76	18,886,434	25.57
	1860	75,082,583	20.73	53,325,037	13.33
South America	1830	6,239,176	8.80	4,587,391	6.21
	1860	35,992,719	9.94	16,742,100	4.18
Asia	1830	5,531,737	7.80	1,845,224	2.50
	1860	26,201,603	2.24	11,067,921	2.77
Oceanica	1830	384,887	.54	93,668	.13
	1860	3,495,226	.96	5,373,497	1.34
Africa	1830	308,797	.44	233,601	.31
	1860	3,798,518	1.05	3,227,760	.81

1865-1904.— The forces at the basis of the commercial development of the United States have been cumulative in their effects, and these effects were therefore most conspicuous during the four decades after the Civil War. As was true of the preceding periods, the increase in international trade was due to the tremendous industrial development of the country and not to any fixed policy looking toward its encouragement. The population of 76,303,387 in 1900 occupied the entire area of over 3,000,000 square miles, stretching from ocean to ocean, and had for some years been filling up formerly neglected areas left undeveloped in its westward march. The density over the entire area had increased from 10.8 in 1860 to 25.66 in 1900. The country had become unified by a railroad system which had increased from 30,626 miles in 1860 to over 200,000 miles, or more than all Europe, in 1902. The total bank clearings had more than doubled, passing $116,000,000,000 in 1902. By the end of the century the United States had taken the first rank in the production and exportation of agricultural products, and in the production of minerals and of manufactured goods. In 40 years the acreage of cultivated lands had trebled, while the value of farm property had increased from $7,980,493,060 to $20,514,001,838, and the value of farm products from $1,958,030,927 in 1870 to $3,764,177,706 in 1900. In 1902 the United States produced approximately two-thirds the world's corn, three-fourths the world's cotton and one-fifth the world's wheat (2,523,648, 312 bushels, 10,680,680 bales and 670,063,008 bushels respectively). In 1901 the production of coal was 261,873,675 tons, of petroleum 2,914,346,148 gallons, pig iron 15,878,354 tons, gold $78,666,700, silver $71,387,800, the entire production of minerals reaching a value of $1,086,529,521. The value of lumber products in 1900 was $566,832,984, and of fisheries about $40,000,000. It is in manufacturing that the most significant advances, both in production and in exports, were made. The increased production was due to the opening up of abundant resources of raw materials of manufacture; to the exploitation of the world's greatest resources of power, both steam and water; to an application of that power through labor-saving machinery that had resulted in the greatest net return per unit of cost; to a highly developed genius for organization and management; and to the stimulus of government assistance through a high protective tariff, which reserved for domestic manufactures the largest home market in the world, with the greatest purchasing power per capita. Exports increased not only as a natural result of this increased productive power, but, during the last decade of the century, the productive power of the United States in certain industries had so nearly reached the limits of the demand of the home market, that, in order to keep invested capital employed at the point of most economical production by finding a market for all it could produce, these manufacturers were compelled for the first time to give serious attention to international trade. Between 1895 and 1903 the imports and exports of merchandise increased one and one half times, from $1,530,508,130 to $2,417,050,530. The value of manufactured products increased from $1,885,861,676 in 1860 to $13,039,279,566 in 1900.

The following table indicates the increase in foreign trade:

MERCHANDISE AND SPECIE IN MILLIONS OF DOLLARS.

Average	Total imports	Total exports	Excess imports * Excess exports †
1865–1869	$ 384.16	$ 368.58	$ 15.57*
1870–1879	535.93	611.13	75.20†
1880–1889	734.28	810.78	76.50†
1890–1899	834.80	1078.62	243.82†
1900–1902	946.32	1528.23	581.91†

Important characteristics of the industrial development of the United States are reflected in the changes in the proportions of the various classes of articles entering into international trade. Between 1870 and 1902 the imports of food and live animals decreased from 32.65 per cent to 22.25 per cent of the total; articles manufactured wholly or partly for use as materials in mechanic arts from 12.59 per cent to 10.09 per cent; of articles manufactured ready for consumption from 27.98 per cent to 16.67 per cent. On the other hand, the imports of crude articles for domestic industries increased from 15.69 per cent to 36.27 per cent. This was due to the increased demand of industries which, like silk, cocoa and rubber manufacture, are dependent on other countries for raw material, and which like those using wool, leather and sugar, find their domestic supply of raw materials inadequate. The increase in the imports of articles for voluntary use, luxuries, etc., was from 11.09 per cent to 14.72 per cent.

Of the exports, agricultural goods retained their preeminence and experienced a marked absolute increase ($68,279,764 in 1870 to $403,641,401 in 1902), but suffered a relative decline from 79.35 per cent of the total to 62.83 per cent. Cotton and wheat continued to lead, the exports in 1902 being $290,651,819 and $112,875,222 respectively. The exports of crude articles whose origin is in mining increased from 1.10 per cent to 2.90 per cent, while the per cent of forest products increased slightly (3.27 per cent to 3.55 per cent) and of fisheries decreased (.62 per cent to .57 per cent). The exports of manufactured goods doubled during the period, increasing from 15 per cent in 1870 to 29.77 per cent in 1902. The above table, in presenting the changes which took place in the exports of important articles of manufacture, indicates also the most important lines along which manufacturing developed.

THOUSANDS OF DOLLARS.

Average.	1871–1880.	1881–1890.	1891–1900.	1902
Agricultural implements	$ 2274.6	$ 2989.8	$ 6167.0	$16286.7
Books, maps, etc	594.2	1353.8	2352.9	3907.9
Brass	399.7	314.1	951.9	1930.8
Cars, carriages, and vehicles	1345.7	2690.5	6124.7	9872.5
Chemicals, drugs, dyes	3057.3	4439.0	7829.4	12141.0
Copper and manufactures	1420.5	2414.7	22789.0	41218.3
Cotton manufactures	6621.0	12748.9	16924.0	32108.3
Fibres (manufactures)	1289.3	1594.6	2289.4	4575.2
India rubber	236.9	708.9	1839.4	4032.1
Instruments, scientific, electric, etc	57.4	676.1	2693.8	5389.4
Iron and steel	15879.6	19485.0	53373.3	98552.5
Leather	6378.3	9495.4	17845.1	29798.3
Musical instruments	642.7	1018.1	1408.5	3694.1
Mineral oils (refined)	37855.9	42956.0	48683.6	66218.0
Paper	837.6	1227.9	3154.9	7312.0
Paraffin and paraffin wax	146.9	1531.0	5038.7	8858.8
Photographic materials	2.0	2.4	305.3	2109.5
Spirits (distilled)	1159.4	2519.2	2797.7	3011.8
Tobacco	2725.6	3014.6	4552.3	5668.8
Manufactures of wood	3647.5	5341.1	7639.7	11617.6
Wool, manufactures	257.9	503.1	795.6	1512.4

The exports of certain other articles in 1902 were (in thousands of dollars) Canned salmon $3991.4, canned fruits $1289.9, furs and fur skins $5030.2, glue and soap stock $2895.3, naval stores $11733.5, oil cake and oil cake meal $19943.1, vegetable oils $15308.6, meat and dairy products $190,861.3.

The changes in the direction of trade are indicated by the following table, the figures representing millions of dollars and per cent of total:

	IMPORTS.		
	1870	1800	1902
Europe	$249.5 (53.98)	$449.9 (57.14)	$475.1 (52.60)
North America	126.5 (27.42)	148.3 (18.84)	151.0 (16.72)
South America	43.5 (9.41)	90.0 (11.43)	119.7 (13.26)
Asia	31.4 (6.78)	67.5 (8.57)	129.6 (14.36)
Oceania	1.4 (.31)	28.3 (3.60)	14.1 (1.57)
Africa	9.8 (2.10)	3.3 (.42)	13.4 (1.49)
	EXPORTS.		
Europe	420.1 (79.35)	683.7 (70.74)	1008.0 (72.96)
North America	68.9 (13.03)	94.1 (10.98)	203.9 (14.76)
South America	21.6 (4.09)	38.7 (4.52)	38.0 (2.75)
Asia	10.9 (2.07)	19.6 (2.30)	63.9 (4.63)
Oceania	4.3 (.82)	16.4 (1.92)	*34.2 (2.48)
Africa	†3.4 (.64)	4.6 (.54)	33.4 (2.42)

* Hawaiian Islands not included. † Includes "All other countries."

Half of our import trade and two-thirds of our export trade is with Europe, the trade with the United Kingdom being about one-third of our total foreign trade. Exports to the United Kingdom are increasing rapidly ($548,548,977 in 1902), while imports are decreasing ($165,746,560). Foodstuffs and cotton continue to be the predominant articles, although manufactured goods, especially machinery and other iron and steel products are becoming more important. Germany is next in importance among European countries (exports in 1902, $173,148,280; imports, $101,997,523), tariff obstacles having been modified by reciprocity arrangements. Trade with France ranks third (exports, $71,512,984; imports $82,880,036 in 1902). Trade with other European countries is relatively small; there is not the same dependence on the United States for food stuffs, and high tariffs, especially in Russia and Austria-Hungary, tend to keep out American products. The geographical advantages of trade with British North America, in which forest and farm products could be exchanged for American manufactured goods, has been neutralized in part by tariff friction. The total trade increased, however, from $86,814,859 in 1893 to $160,445,848 in 1902. Trade with American countries south of the United States has increased slowly because the United States is self-sufficient in many of the southern temperate zone products, while Europe could take those products and send manufactured goods in exchange. The United States, however, takes wool and hides and leather, and tropical and semi-tropical products like rubber, dyewoods, mahogany, fruits, sugar and coffee, and exchanges for them commodities like petroleum, lard, hardware and cotton goods. The total trade of the most important of these countries with the United States in 1902 was: Brazil, $89,569,167; Mexico, $80,256,202; Cuba, $61,318,184; Argentina, $20,922,525; Chile, $11,455,281. The increasing trade with Asia is of significance, inasmuch as the greatest increase is of the export of manufactured goods to that continent. A policy of exclusion shuts out American goods from territory under Russian influence; in other countries the trade in 1902 was: China, exports, $24,722,906, imports, $21,055,830; Japan, exports, $21,485,883, imports, $37,552,778. In 1893 the exports to China and Japan were only $3,900,457 and $3,195,494 respectively. In the trade with India and the East Indies imports are in great preponderance. The exports to British Africa in 1902 were $28,780,105, and the imports $979,361; the exports having increased from $3,688,099 in 1893. The exports to British Australasia increased from $7,921,228 in 1893 to $28,375,199 in 1902, while imports decreased from $7,266,808 to $5,386,509. During the same ten years the imports from the Philippines decreased from $9,159,857 to $5,258,470, while exports increased from $154,378 to $5,258,470.

The high war tariff is still the basis of the commercial policy of the United States, although, since the United States has become relatively self-sufficient in manufactured as well as other products, there have been indications of a change of policy, and it seems likely to be modified more and more by reciprocity agreements. The direct influence of the tariff has been to discourage foreign trade; such advances in that trade as have been pointed out have been in spite of it, because of sheer physical strength. It may perhaps be said to have indirectly encouraged international trade by constructing a basis for it in the strong home industries which it has built up. But that basis once constructed, international trade is likely to become less and less patient of tariff barriers. In most instances where applied, foreign trade seems to have been promoted by the policy of reciprocity treaties. The most important of these treaties have been with Canada (1855–1866), Hawaii (1876–1900); with Guatemala, Honduras, Nicaragua, Salvador, British West Indies, Santo Domingo, Cuba, Porto Rico, Brazil, British Guiana, Austria-Hungary and Germany (under the Act of 1890; terminated by the Act of 1894); and with Germany, France, Italy, Portugal and Switzerland (under the Act of 1897). In 1903 a reciprocity treaty was concluded with Cuba. The treaties with Germany, France, Italy, Portugal, the Azores and the Madeira Islands, and with Cuba are still in force. The establishment of sound currency and banking systems has contributed to the development of international trade during the period. On the other hand, the panics of 1873 and 1893 and the years of depression following each, were periods of temporary decline. Accompanying this marked increase in foreign trade has appeared a serious decline in the shipping of the United States engaged in it. This decline is presented in the following table:

	Am. vessels engaged in foreign trade	Per cent imports in Am. vessels	Per cent exports in Am. vessels
1860	2,546,237 tons	63	70
1870	1,516,800 "	33.1	37.7
1880	1,352,810 "	22.9	13.1
1890	946,695 "	16.7	9.4
1900	826,694 "	12.9	7.1
1902	884,555 "	12.1	6.6

The beginning of this decline is a reflection of the changed conditions of ship construction at the middle of the century, when construction of iron and steel, in which England at that time had an advantage, was substituted for construction of wood, in which the United States had an advantage. Its continuance, however, is rather a reflection of the commercial policy of the period. High duties on the materials for the construction of iron and steel vessels, the restrictions of the Navigation Laws, high local taxation, tonnage dues and restrictions as to the hiring of seamen have all contributed. The tariff policy in general has discouraged shipping by tending to oppose a natural exchange of commodities and a more even-balancing of cargoes. The decline has been due also to the general industrial situation, in which attention has been concentrated on the building up of home markets and not on the development of foreign trade. Until recent years the trade of the United States may be said to have been due more to the necessity of the foreigner to buy than to the necessity of the United States to sell and the locus of the necessity has been the locus of the attention to shipping. The change of attitude from that of an almost passive willingness to supply foreign demands for necessities to an active desire to dispose of surpluses of manufactured goods in competive markets should have a profound effect not only on foreign trade, but also on the re-establishment of American shipping in that trade.

Domestic Commerce.— The value of the internal trade of the United States has been estimated to be some 28 times as great as the ex-

ternal trade (about $28,000,000,000) and the volume about 25 times as great. Practically all articles that enter into foreign commerce enter also into domestic commerce, and in addition there is the movement of that great volume of commodities produced within the country and in continual flow from one part to another. The ton-miles of freight carried by railroads increased from 39,202,209,249 in 1882 to 156,624,166,024 in 1902. The conditions of industry in the United States have made inevitable an internal trade of so great volume. No other industrially developed country possesses so vast an area practically physically, politically and socially homogeneous. Neither of the two mountain systems is a comparatively serious obstacle to commerce, and the river and lake systems are its instruments. The separate states may not interfere with commerce in a way to destroy the freedom of intercourse of one region with another. The population, both of native and of foreign stock, has developed a uniformly high degree of energy in industrial activity. Accompanying these aspects of homogeneity is a great variety of resources and activities. The climatic range is represented by a difference of 40° in mean annual temperature: by cotton, sugar and semi-tropical fruits in the south and white pine and cereals in the north. Differences in climate, soils and geological formation are represented by coal and iron in the Appalachian and Superior regions, gold and silver in the Cordilleran system, copper around Lake Superior and in Montana, agriculture in the Mississippi basin, and grazing on the western plains. The northern States east of the Mississippi constitute a relatively dense manufacturing region. In many items of resources, among them the basic materials of industry, the United States assumes a leading position. Because in the production of wheat, corn, cotton, animal products, lumber, coal, iron ore, copper, and in the value of manufactures, the United States leads the world, and is in the front rank in the production of precious metals, the internal movement of goods is necessarily great. These conditions of size; of physical, political and social homogeneity; of abundant and diverse resources; of great industrial energy; and of the possession of adequate instruments of communication explain the volume and value of domestic commerce. The increase of internal trade, and of the area concerned in it, has accompanied the extension of settlement and the exploitation of new resources suggested in the preceding section: it has been a condition precedent to the increase of foreign trade. During the first decades of the last century, the flow of commodities was along the Atlantic coast and along the Mississippi, the Hudson and the Delaware, while cotton was moved on the rivers of the south. The water routes, especially the Mississippi and its tributaries and the Erie Canal, remained most important until near the middle of the century. With the construction of railroads, the centre of gravity rapidly shifted. In 1861 the Erie Canal carried 2,070,251 tons of flour, meal and grain; in 1899 only 562,740 tons. The construction of railroads began in 1830; in 1840 there were 2,755 miles, confined to the Atlantic States. By 1850 the railroads had extended into western New York, western Pennsylvania and Maryland, and construction was under way in the Mississippi Valley and the Lake States. By 1860 there were 28,919 miles; construction had begun in the South, had increased in the Mississippi Valley and the middle West, and the latter region had been connected with the North Atlantic seaboard by rail as well as by canal. After 1870 the extension was chiefly west of the Mississippi and in the South. In 1902 there were 203,132 miles of railroads, which with the water routes still of importance, presented the following channels of transportation: Trunk lines (1) connecting the Mississippi Valley with the North Atlantic ports; (2) connecting the Mississippi Valley with the South Atlantic ports; (3) connecting the Mississippi Valley with the Gulf ports; (4) connecting the Mississippi Valley with the Pacific States; (5) coastwise routes of the Great Lakes; (6) the Mississippi River; (7) the coastwise routes of the Atlantic, the Gulf, and the Pacific (including Porto Rico, Hawaii, and likely to include the Philippines); (8) minor water routes like the Erie Canal, the Hudson River, and the Kentucky River. The direction of the flow of domestic trade is determined by the relation to one another of regions of important products, routes of rail and water transportation and the denser areas of population. Most of the imports are received at New York, which becomes thereby the great primary distributing centre of such commodities. The value of the imports received at various ports was, in 1902: New York, $559,930,849; Boston, $71,921,436; Philadelphia, $47,750,342; San Francisco, $35,183,755; New Orleans, $23,763,480; Baltimore, $22,825,281. The relative rank of the cities as ports of entry has varied but slightly. As points of concentration for export, these cities ranked in 1902 as follows: New York, $490,361,695; New Orleans, $134,486,863; Boston, $102,409,304; Baltimore, $80,532,512; Philadelphia, $80,383,403; San Francisco, $38,183,175. New York early took the lead because of its excellent harbor, its situation relative to European markets, and because it became the terminus of the first trunk rail and water route from the Middle West. Although the lead has been retained, relatively other of the cities named have advanced more rapidly. Philadelphia and Baltimore have become the termini of important trunk lines, which have favored these cities by differential rates. New Orleans has enjoyed the advantage of proximity to the cotton fields and become the terminus of important north and south trunk lines. The movement of goods destined for export has not been confined to these points; Portland, Maine, for instance, has become the terminus of a trunk line reaching back into the cereal and animal husbandry regions, while cities like Newport News, Norfolk, Charleston, Savannah, Pensacola, Mobile and Galveston have become important cotton shipping points.

Only in its broadest outlines can the movement of goods within the interior of the country be presented, and that only with respect to leading articles. The cotton of the South flows from the local market towns toward the larger distributing centres like Houston and Galveston, Texas; Shreveport and New Orleans, La.; St. Louis, Mo.; Vicksburg and Columbus, Miss.; Nashville, Tenn.; Montgomery and Mobile, Ala.; Augusta, Macon, Columbus and Savanna, Ga.; Port Royal and Charleston, S. C.; Wilmington, N. C.; Norfolk and Newport News, Va.; Baltimore, Md.; and even Philadelphia and New

York. Anthracite coal of eastern Pennsylvania finds its chief receiving and distributing centres at Philadelphia, New York, and Buffalo, while the bituminous coal is carried in all directions from a large area of production in the centre of the country. The Monongahela and Ohio rivers are important coal routes. The fruits and garden products of the coast and the dairy and garden products of New England and New York converge upon the congested manufacturing regions. The manufactures and imports of the East and the imported and domestic fruits of the South flow west and north respectively into the receiving and distributing centres of the Middle West. The wool of the western and middle western States moves toward the textile centres of the East, while the cattle of the range States converge upon the corn fields of the middle Mississippi, whence, after fattening, they move to the slaughtering and packing centres, Chicago, Kansas City, South Omaha, Saint Joseph, Indianapolis, and Saint Louis. From these distributing points the slaughtering and packing products flow toward the markets and ports of the East. Of the cereals, corn converges upon Chicago, Saint Louis and the cities of the region between these markets; while wheat, the centre of the production of which is farther to the north, moves chiefly toward Minneapolis, Duluth, Superior, and Chicago. Most of the flour finds its way to the eastern markets and ports by rail, while the remainder and practically all the bulk grain move as far as Buffalo by water. The ores of the Lake Superior region are carried almost entirely by water to the Lake ports, Chicago, Buffalo, Cleveland, and other Erie ports, and, by an additional short rail haul, to the iron and steel manufacturing region within the quadrant defined by Cleveland, Youngstown, Pittsburg and Wheeling. The lumber of the South is carried northward and that of Maine southward by coasting vessels; while there is a large movement by rail from the interior. The lumber of the North Central States finds its way into commerce through the lakes, the Mississippi and the Erie Canal and the Hudson, as well as by through railroad connection at the southern lake ports. The lumber and grain of the Pacific States move toward the ports of San Francisco, Willamette, Tacoma, Seattle, and Portland, while the fruits are carried across the mountains and plains to the markets of the east by fast transcontinental freight trains.

While the foreign commerce of the United States is carried chiefly in foreign bottoms (see preceding section), the coastwise trade, from which foreign bottoms are excluded by the Navigation Laws is carried in shipping belonging to the United States. The increase of that shipping in total tons employed has been: (1860) 2,644,867; (1870) 2,638,247; (1880) 2,637,686; (1890) 3,409,435; (1900) 4,286,516; (1903) 5,141,037. Its distribution in 1903 is indicated in the following table of tons employed:

	Sail	Steam	Canal	Barges.	Total
Atlantic and Gulf	1,260,372	1,382,708	.....	475,975	3,149,711
Porto Rico	5,528	2,134	.....	.....	7,662
Pacific	357,856	378,958	.....	39,045	775,859
Hawaii	26,073	9,347	30,656	.....	36,320
Northern lakes	315,195	1,467,902	47,750	71,761	1,902,698
Western rivers	.....	166,949	.....	48,146	215,095

See also COMMERCE; COMMERCIAL ORGANIZATIONS.

HARLOW S. PERSON,
Professor of History, Dartmouth College.

60. United States Presidents and Vice-Presidents. From 30 April 1789 to 30 April 1904 there have been 34 presidents and 29 vice-presidents of the United States. The names of these executive officers with the names of the States from which they were elected together with their tenure of office follows:

PRESIDENTS AND VICE-PRESIDENTS.

PRESIDENTS	VICE-PRESIDENTS	DATE
George Washington, of Va.	John Adams, of Mass.	April 30, 1789, to March 3, 1793.
George Washington, of Va.	John Adams, of Mass.	March 4, 1793, to March 3, 1797.
John Adams, of Mass.	Thomas Jefferson, of Va.	March 4, 1797, to March 3, 1801.
Thomas Jefferson, of Va.	Aaron Burr, of N. Y.	March 4, 1801, to March 3, 1805.
Thomas Jefferson, of Va.	George Clinton, of N. Y.	March 4, 1805, to March 3, 1809.
James Madison, of Va.	* George Clinton, of N. Y.	March 4, 1809, to March 3, 1813.
James Madison, of Va.	† Elbridge Gerry, of Mass.	March 4, 1813, to March 3, 1817.
James Monroe, of Va.	Daniel D. Tompkins, of N. Y.	March 4, 1817, to March 3, 1821.
James Monroe, of Va.	Daniel D. Tompkins, of N. Y.	March 5, 1821, to March 3, 1825.
John Quincy Adams, of Mass.	John C. Calhoun, of S. C.	March 4, 1825, to March 3, 1829.
Andrew Jackson, of Tenn.	‡ John C. Calhoun, of S. C.	March 4, 1829, to March 3, 1833.
Andrew Jackson, of Tenn.	Martin Van Buren, of N. Y.	March 4, 1833, to March 3, 1837.
Martin Van Buren, of N. Y.	Richard M. Johnson, of Ky.	March 4, 1837, to March 3, 1841.
§ William Henry Harrison, of Ohio.	John Tyler, of Va.	March 4, 1841, to April 4, 1841.
John Tyler, of Va.		April 6, 1841, to March 3, 1845.
James K. Polk, of Tenn.	George M. Dallas, of Pa.	March 4, 1845, to March 3, 1849.
‖ Zachary Taylor, of La.	Millard Fillmore, of N. Y.	March 5, 1849, to July 9, 1850.
Millard Fillmore, of N. Y.		July 10, 1850, to March 3, 1853.
Franklin Pierce, of N. H.	° William R. King, of Ala.	March 4, 1853, to March 3, 1857.
James Buchanan, of Pa.	John C. Breckinridge, of Ky.	March 4, 1857, to March 3, 1861.
Abraham Lincoln, of Illinois.	Hannibal Hamlin, of Me.	March 4, 1861, to March 3, 1865.
** Abraham Lincoln, of Ill.	Andrew Johnson, of Tenn.	March 4, 1865, to April 15, 1865.
Andrew Johnson, of Tenn.		April 15, 1865, to March 3, 1869.
Ulysses S. Grant, of Illinois.	Schuyler Colfax, of Ind.	March 4, 1869, to March 3, 1873.
Ulysses S. Grant, of Ill.	†† Henry Wilson, of Mass.	March 4, 1873, to March 3, 1877.
Rutherford B. Hayes, of Ohio.	William A. Wheeler, of N. Y.	March 5, 1877, to March 3, 1881.
‡‡ James A. Garfield, of Ohio.	Chester A. Arthur, of N. Y.	March 4, 1881, to Sept. 19, 1881.
Chester A. Arthur, of N. Y.		Sept. 20, 1881, to March 3, 1885.

* Died April 20, 1812
† Died Nov. 23, 1814.
‡ Resigned Dec. 28, 1832.
§ Died April 4, 1841.
‖ Died July 9, 1850.
° Died April 18, 1853.
** Died April 15, 1865.
†† Died Nov. 22, 1875.
‡‡ Died Sept. 19, 1881.

UNITED STATES — PRESIDENTS AND VICE-PRESIDENTS

PRESIDENTS	VICE-PRESIDENTS	DATE
Grover Cleveland, of N. Y.	§§ Thomas A. Hendricks, of Ind.	March 4, 1885, to March 3, 1889.
Benjamin Harrison, of Ind.	Levi P. Morton, of N. Y.	March 4, 1889, to March 3, 1893.
Grover Cleveland, of N. Y.	Adlai E. Stevenson, of Ill.	March 4, 1893, to March 3, 1897.
William McKinley, of Ohio.	‖‖ Garret A. Hobart, of N. Y.	March 4, 1897, to March 3, 1901.
¶¶ William McKinley, of Ohio.	Theodore Roosevelt, of N. Y.	March 4, 1901, to Sept. 14, 1901.
Theodore Roosevelt, of N. Y.		Sept. 14, 1901, to

§§ Died Nov. 25, 1885. ‖‖ Died Nov. 21, 1899. ¶¶ Died Sept. 14, 1901.

Election of President and Vice-President.— Under Article II. of the Constitution of the United States each State is authorized to appoint, in such manner as the legislature thereof may direct, a number of electors equal to the whole number of Senators and Representatives to which the State may be entitled in the Congress; but no Senator or Representative, or person holding an office of trust or profit under the United States, shall be appointed an elector.

(Article XII. of amendments, proclaimed 25 Sept. 1804.) The Electors shall meet in their respective states, and vote by ballot for President and Vice-President, one of whom, at least, shall not be an inhabitant of the same state with themselves; they shall name in their ballots the person voted for as President, and in distinct ballots the person voted for as Vice-President, and they shall make distinct lists of all persons voted for as President, and of all persons voted for as Vice-President, and of the number of votes for each, which lists they shall sign and certify, and transmit sealed to the seat of the government of the United States, directed to the President of the Senate;— the President of the Senate shall, in the presence of the Senate and House of Representatives, open all the certificates and the votes shall then be counted;— The person having the greatest number of votes for President, shall be the President, if such number be a majority of the whole number of Electors appointed; and if no person have such majority, then from the persons having the highest numbers not exceeding three on the list of those voted for as President, the House of Representatives shall choose immediately, by ballot, the President. But in choosing the President, the votes shall be taken by States, the representation from each State having one vote; a quorum for this purpose shall consist of a member or members from two-thirds of the States, and a majority of all the States shall be necessary to a choice. And if the House of Representatives shall not choose a President whenever the right of choice shall devolve upon them, before the fourth day of March next following, then the Vice President shall act as President, as in the case of the death or other constitutional disability of the President. The person having the greatest number of votes as Vice-President, shall be the Vice-President, if such number be a majority of the whole number of electors appointed, and if no person have a majority, then from the two highest numbers on the list, the Senate shall choose the Vice-President; a quorum for the purpose shall consist of two-thirds of the whole number of senators, and a majority of the whole number shall be necessary to a choice. But no person constitutionally ineligible to the office of President shall be eligible to that of Vice-President of the United States.

The first four elections were held under the 2d Article of the Constitution, which made no provision for the separation of the President from the Vice-President in the voting. In the fourth election, it was found that Jefferson and Burr had each received a majority and an equal number of the electoral votes, and the resulting contest in the House of Representatives demonstrated the need of the 12th Amendment to the Constitution.

Presidential Succession.—The Act of 1 March 1792, provided that in case of the removal, death, resignation, or inability both of the President and Vice-President, the President of the Senate *pro tempore*, and in case there shall be no President of the Senate, then the Speaker of the House of Representatives, for the time being shall act as President until the disability be removed or a President shall be elected. This arrangement continued in force until 19 Jan. 1886, when an act was approved which provided for the performance of the duties of the President, in case of removal, death, resignation, or inability of both the President and Vice-President, by the following officers in order, namely: The Secretary of State, Secretary of the Treasury, Secretary of War, Attorney-General, Postmaster-General, Secretary of the Navy, and Secretary of the Interior.

Electoral Votes for President and Vice-President of the United States of America.

ELECTION FOR THE FIRST TERM, COMMENCING 4 MARCH 1789, AND TERMINATING 3 MARCH 1793.

Number of electoral votes	States	G. Washington, Virginia	John Adams, Massachusetts	S. Huntington, Connecticut	John Jay, New York	John Hancock, Massachusetts	R. H. Harrison, Maryland	George Clinton, New York	John Rutledge, South Carolina	John Milton, Georgia	Jas. Armstrong, Georgia	Edward Telfair, Georgia	Benj. Lincoln, Massachusetts
5	New Hampshire	5	5	..	..	..	..	..	..	..	..	..	..
10	Massachusetts	10	10	..	..	..	..	..	..	..	..	..	..
7	Connecticut	7	5	2	..	..	..	..	..	..	..	..	..
6	New Jersey	6	1	..	5	..	..	..	..	..	..	..	..
10	Pennsylvania	10	8	..	2	..	..	..	..	..	..	..	..
3	Delaware	3	..	..	3	..	..	..	..	..	..	..	..
6	Maryland	6	..	..	..	..	6	..	..	..	..	..	..
10	Virginia	10	5	..	1	1	..	3	..	..	..	..	..
7	South Carolina	7	..	..	..	1	..	..	6	..	..	..	..
5	Georgia	5	..	..	..	..	..	..	..	2	1	1	1
69	Whole number	69	34	2	9	4	6	3	6	2	1	1	1
	Necessary to elect, 35.												

ELECTION FOR THE SECOND TERM, COMMENCING 4 MARCH 1793 AND TERMINATING 3 MARCH 1797.

Number of electoral votes	States	G. Washington, Virginia	John Adams, Massachusetts	George Clinton, New York	Thos. Jefferson, Virginia	Aaron Burr, New York
6	New Hampshire	6	6	..	..	..
16	Massachusetts	16	16	..	..	..
4	Rhode Island	4	4	..	..	..
9	Connecticut	9	9	..	..	..
3	Vermont	3	3	..	..	..
12	New York	12	..	12	..	..
7	New Jersey	7	7	..	..	..
15	Pennsylvania	15	14	1	..	..
3	Delaware	3	3	..	..	..
8	Maryland	8	8	..	..	..
21	Virginia	21	..	21	..	..
4	Kentucky	4	..	..	4	..
12	North Carolina	12	..	12	..	..
8	South Carolina	8	7	..	..	1
4	Georgia	4	..	4	..	..
132	Whole number Necessary to elect, 67.	132	77	50	4	1

ELECTION FOR THE THIRD TERM, COMMENCING 4 MARCH 1797 AND TERMINATING 3 MARCH 1801.

Number of electoral votes	States	John Adams, Massachusetts	Thos. Jefferson, Virginia	Thos. Pinckney, South Carolina	Aaron Burr, New York	Samuel Adams, Massachusetts	O. Ellsworth, Connecticut	John Jay, New York	George Clinton, New York	S. Johnston, North Carolina	James Iredell, North Carolina	G. Washington, Virginia	C. C. Pinckney, South Carolina	John Henry, Maryland
3	Tennessee	..	3	..	3	..	..	..	..	..	..	..	..	..
4	Kentucky	..	4	..	4	..	..	..	..	..	..	..	..	..
4	Georgia	..	..	..	..	..	..	..	4	..	..	..	..	..
8	South Carolina	..	8	8	..	..	..	..	..	..	..	..	..	..
12	North Carolina	1	11	1	6	..	..	..	..	..	..	1	1	..
21	Virginia	1	20	1	1	15	..	..	3	..	..	1	..	..
11	Maryland	7	4	4	3	..	..	..	..	..	..	..	..	2
3	Delaware	3	..	3	..	..	..	..	..	..	..	..	..	..
15	Pennsylvania	1	14	2	13	..	..	..	..	..	..	..	..	..
7	New Jersey	7	..	7	..	..	..	..	..	..	..	..	..	..
12	New York	12	..	12	..	..	..	..	..	..	..	..	..	..
9	Connecticut	9	..	4	..	..	..	5	..	..	..	..	..	..
4	Rhode Island	4	..	..	..	..	4	..	..	..	..	..	..	..
16	Massachusetts	16	..	13	..	..	1	..	..	2	..	..	..	..
4	Vermont	4	..	4	..	..	..	..	..	..	..	..	..	..
6	New Hampshire	6	..	..	..	..	6	..	..	..	..	..	..	..
139	Whole number Necessary to elect, 70.	71	68	59	30	15	11	5	7	2	3	2	1	2

ELECTION FOR THE FOURTH TERM, COMMENCING 4 MARCH 1801 AND TERMINATING 3 MARCH 1805.

Number of electoral votes	States	Thos. Jefferson, Virginia	Aaron Burr, New York	John Adams, Massachusetts	C. C. Pinckney, South Carolina	John Jay, New York
6	New Hampshire	..	..	6	6	..
16	Massachusetts	..	..	16	16	..
4	Rhode Island	..	..	4	3	1
9	Connecticut	..	..	9	9	..
4	Vermont	..	..	4	4	..
12	New York	12	12	..	..	..
7	New Jersey	7	7	..	..	..
15	Pennsylvania	8	8	..	..	..
3	Delaware	..	..	..	..	..
10	Maryland	5	5	..	..	..
21	Virginia	21	21	..	..	..
4	Kentucky	4	4	..	..	..
12	North Carolina	8	8	4	4	..
3	Tennessee	3	3	..	..	..
8	South Carolina	8	8	..	..	..
4	Georgia	4	4	..	..	..
138	Whole number Necessary to elect, 70.	73	73	65	64	1

The electoral votes for Jefferson and Burr being equal, the election was thrown into the House of Representatives, and Jefferson was chosen by the votes of ten States.

ELECTION FOR THE FIFTH TERM, COMMENCING 4 MARCH 1805 AND TERMINATING 3 MARCH 1809.

Number of electoral votes	States	President		Vice President	
		Thos. Jefferson, Virginia	C. C. Pinckney, South Carolina	George Clinton, New York	Rufus King, New York
7	New Hampshire	7	..	7	..
19	Massachusetts	19	..	19	..
4	Rhode Island	4	..	4	..
9	Connecticut	..	9	..	9
6	Vermont	6	..	6	..
19	New York	19	..	19	..
8	New Jersey	8	..	8	..
20	Pennsylvania	20	..	20	..
3	Delaware	..	3	..	3
11	Maryland	9	2	9	2
24	Virginia	24	..	24	..
14	North Carolina	14	..	14	..
10	South Carolina	10	..	10	..
6	Georgia	6	..	6	..
5	Tennessee	5	..	5	..
8	Kentucky	8	..	8	..
3	Ohio	3	..	3	..
176	Whole number	162	14	162	14
	Necessary to elect, 89.				

ELECTION FOR THE SIXTH TERM, COMMENCING 4 MARCH 1809 AND TERMINATING 3 MARCH 1813.

Number of electoral votes	States	President			Vice President				
		James Madison, of Virginia	George Clinton, of New York	C. C. Pinckney, of South Carolina	George Clinton, of New York	James Madison, of Virginia	James Monroe, of Virginia	John Langdon, of New Hampshire	Rufus King, of New York
7	New Hampshire	..	..	7	..	..	..	..	7
19	Massachusetts	..	..	19	..	..	..	..	19
4	Rhode Island	..	..	4	..	..	..	..	4
9	Connecticut	..	..	9	..	..	..	..	9
6	Vermont	6	..	..	..	..	..	6	..
19	New York	13	6	..	13	3	3	..	..
8	New Jersey	8	..	..	8	..	..	..	..
20	Pennsylvania	20	..	..	20	..	..	..	..
3	Delaware	..	..	3	..	..	..	..	3
11	Maryland	9	2	..	9	..	..	..	2
24	Virginia	24	..	..	24	..	..	..	..
14	North Carolina	11	..	3	11	..	..	..	3
10	South Carolina	10	..	..	10	..	..	..	..
6	Georgia	6	..	..	6	..	..	..	..
7	Kentucky	7	..	..	7	..	..	..	..
5	Tennessee	5	..	..	5	..	..	..	..
3	Ohio	3	..	..	..	..	..	3	..
175	Whole number	122	6	47	113	3	3	9	47
	Necessary to elect, 88.								

ELECTION FOR THE SEVENTH TERM, COMMENCING 4 MARCH 1813 AND TERMINATING 3 MARCH 1817.

Number of electoral votes	States	President		Vice President	
		James Madison, Virginia	De Witt Clinton, New York	Elbridge Gerry, Massachusetts	Jared Ingersoll, Pennsylvania
8	New Hampshire	..	8	1	7
22	Massachusetts	..	22	2	20
4	Rhode Island	..	4	..	4
9	Connecticut	..	9	..	9
8	Vermont	8	..	8	..
29	New York	..	29	..	29
8	New Jersey	..	8	..	8
25	Pennsylvania	25	..	25	..
4	Delaware	..	4	..	4
11	Maryland	6	5	6	5

ELECTION FOR THE SEVENTH TERM — *Continued.*

Number of electoral votes	States	President		Vice President	
		James Madison, Virginia	De Witt Clinton, New York	Elbridge Gerry, Mass.	Jared Ingersoll, Penna.
25	Virginia	25	..	25	..
15	North Carolina	15	..	15	..
11	South Carolina	11	..	11	..
8	Georgia	8	..	8	..
12	Kentucky	12	..	12	..
8	Tennessee	8	..	8	..
7	Ohio	7	..	7	..
3	Louisiana	3	..	3	..
217	Whole number	128	89	131	80
	Necessary to elect, 109.				

ELECTION FOR THE EIGHTH TERM, COMMENCING 4 MARCH 1817 AND TERMINATING 3 MARCH 1821.

Number of electoral votes	States	President		Vice President				
		James Monroe, Virginia	Rufus King, New York	D. D. Tompkins, New York	Jno. E. Howard, Maryland	James Ross, Pennsylvania	John Marshall, Virginia	Robt. G. Harper, Maryland
8	New Hampshire	8	..	8	..	..	..	..
22	Massachusetts	..	22	..	22	..	..	..
4	Rhode Island	4	..	4	..	..	..	..
9	Connecticut	..	9	..	..	5	4	..
8	Vermont	8	..	8	..	..	..	..
29	New York	29	..	29	..	..	..	..
8	New Jersey	8	..	8	..	..	..	..
25	Pennsylvania	25	..	25	..	..	..	..
3	Delaware	..	3	..	..	..	..	3
8	Maryland	8	..	8	..	..	..	..
25	Virginia	25	..	25	..	..	..	..
15	North Carolina	15	..	15	..	..	..	..
11	South Carolina	11	..	11	..	..	..	..
8	Georgia	8	..	8	..	..	..	..
12	Kentucky	12	..	12	..	..	..	..
8	Tennessee	8	..	8	..	..	..	..
8	Ohio	8	..	8	..	..	..	..
3	Louisiana	3	..	3	..	..	..	..
3	Indiana	3	..	3	..	..	..	..
217	Whole number	183	34	183	22	5	4	3
	Necessary to elect, 109.							

ELECTION FOR THE NINTH TERM, COMMENCING 4 MARCH 1821, AND TERMINATING 3 MARCH 1825.

Number of electoral votes	States	President		Vice President				
		James Monroe, Virginia	J. Q. Adams, Massachusetts	D. D. Tompkins, New York	Richard Stockton, New Jersey	R. G. Harper, Maryland	Richard Rush, Pennsylvania	Daniel Rodney, Delaware
8	New Hampshire	7	1	7	..	..	1	..
15	Massachusetts	15	..	7	8	..	..	..
4	Rhode Island	4	..	4	..	..	..	..
9	Connecticut	9	..	9	..	..	..	..
8	Vermont	8	..	8	..	..	..	..
29	New York	29	..	29	..	..	..	..
8	New Jersey	8	..	8	..	..	..	..
25	Pennsylvania	24	..	24	..	..	..	..
4	Delaware	4	..	..	..	..	..	4
11	Maryland	11	..	10	..	1	..	..
25	Virginia	25	..	25	..	..	..	..
15	North Carolina	15	..	15	..	..	..	..
11	South Carolina	11	..	11	..	..	..	..
8	Georgia	8	..	8	..	..	..	..
12	Kentucky	12	..	12	..	..	..	..
8	Tennessee	7	..	7	..	..	..	..
8	Ohio	8	..	8	..	..	..	..
3	Louisiana	3	..	3	..	..	..	..
3	Indiana	3	..	3	..	..	..	..
3	Mississippi	2	..	2	..	..	..	..
3	Illinois	3	..	3	..	..	..	..
3	Alabama	3	..	3	..	..	..	..
9	Maine	9	..	9	..	..	..	..
3	Missouri	3	..	3	..	..	..	..
235	Whole number	231	1	218	8	1	1	4
	Necessary to elect, 118.							

ELECTION FOR THE TENTH TERM, COMMENCING 4 MARCH 1825 AND TERMINATING 3 MARCH 1829.

Number of electoral votes	States	President.				Vice President.					
		Andrew Jackson, Tennessee	John Q. Adams, Massachusetts	W. H. Crawford Georgia	Henry Clay, Kentucky	J. C. Calhoun, South Carolina	Nathan Sanford, New York	Nath'l Macon, North Carolina	Andrew Jackson, Tennessee	M. Van Buren, New York	Henry Clay, Kentucky
8	New Hampshire	..	8	..	..	7	..	..	1	..	..
15	Massachusetts	..	15	..	..	15	..	..	..	..	..
4	Rhode Island	..	4	..	..	3	..	..	..	..	..
8	Connecticut	..	8	..	..	..	..	..	8	..	..
7	Vermont	..	7	..	..	7	..	..	..	..	..
36	New York	1	26	5	4	29	7	..	..	..	..
8	New Jersey	8	..	..	..	8	..	..	..	..	..
28	Pennsylvania	28	..	..	..	28	..	..	..	..	..
3	Delaware	..	1	2	..	1	..	..	..	..	2
11	Maryland	7	3	1	..	10	..	..	1	..	..
24	Virginia	..	..	24	..	..	..	24	..	..	..
15	North Carolina	15	..	..	..	15	..	..	..	..	..
11	South Carolina	11	..	..	..	11	..	..	..	..	..
9	Georgia	..	..	9	..	..	..	..	..	9	..
14	Kentucky	..	..	..	14	7	7	..	..	..	..
11	Tennessee	11	..	..	..	11	..	..	..	..	..
16	Obio	..	..	..	16	..	16	..	..	..	..
5	Louisiana	3	2	..	..	5	..	..	..	..	..
5	Indiana	5	..	..	..	5	..	..	..	..	..
3	Mississippi	3	..	..	..	3	..	..	..	..	..
3	Illinois	2	1	..	..	3	..	..	..	..	..
5	Alabama	5	..	..	..	5	..	..	..	..	..
9	Maine	..	9	..	..	9	..	..	..	..	..
3	Missouri	..	..	..	3	..	..	..	3	..	..
261	Whole number.... Necessary to elect, 131.	99	84	41	37	182	30	24	13	9	2

ELECTION FOR THE ELEVENTH TERM, COMMENCING 4 MARCH 1829 AND TERMINATING 3 MARCH 1833.

Number of electoral votes	States	President		Vice President		
		Andrew Jackson, Tennessee	John Q. Adams, Massachusetts	Jno. C. Calhoun, South Carolina	Richard Rush, Pennsylvania	William Smith, South Carolina
9	Maine	1	8	1	8	..
8	New Hampshire	..	8	..	8	..
15	Massachusetts	..	15	..	15	..
4	Rhode Island	..	4	..	4	..
8	Connecticut	..	8	..	8	..
7	Vermont	..	7	..	7	..
36	New York	20	16	20	16	..
8	New Jersey	..	8	..	8	..
28	Pennsylvania	28	..	28	..	..
3	Delaware	..	3	..	3	..
11	Maryland	5	6	5	6	..
24	Virginia	24	..	24	..	..
15	North Carolina	15	..	15	..	..
11	South Carolina	11	..	11	..	..
9	Georgia	9	..	2	..	7
14	Kentucky	14	..	14	..	..
11	Tennessee	11	..	11	..	..
16	Ohio	16	..	16	..	..
5	Louisiana	5	..	5	..	..
3	Mississippi	3	..	3	..	..
5	Indiana	5	..	5	..	..
3	Illinois	3	..	3	..	..
5	Alabama	5	..	5	..	..
3	Missouri	3	..	3	..	..
261	Whole number.... Necessary to elect, 131.	178	83	171	83	7

ELECTION FOR THE TWELFTH TERM, COMMENCING 4 MARCH 1833 AND TERMINATING 3 MARCH 1837.

Number of electoral votes	States	President				Vice President				
		Andrew Jackson, Tennessee	Henry Clay, Kentucky	John Floyd, Virginia	Wm. Wirt, Maryland	M. Van Buren, New York	John Sergeant, Pennsylvania	Wm. Wilkins, Pennsylvania	Henry Lee, Massachusetts	Amos Ellmaker, Pennsylvania
10	Maine	10	..	..	..	10	..	..	..	..
7	New Hampshire	7	..	..	..	7	..	..	..	..
14	Massachusetts	..	14	..	..	..	14	..	..	..
4	Rhode Island	..	..	..	..	..	4	..	..	..
8	Connecticut	..	..	..	..	..	8	..	..	..
7	Vermont	..	..	..	7	..	..	..	..	7
42	New York	42	..	..	..	42	..	..	..	..
8	New Jersey	8	..	..	..	8	..	..	..	..
30	Pennsylvania	30	..	..	..	..	..	30	..	..
3	Delaware	..	3	..	..	..	3	..	..	..
10	Maryland	3	5	..	..	3	5	..	..	..
23	Virginia	23	..	..	..	23	..	..	..	..
15	North Carolina	15	..	..	..	15	..	..	..	..
11	South Carolina	..	..	11	..	..	..	..	11	..
11	Georgia	11	..	..	..	11	..	..	..	..
15	Kentucky	..	15	..	..	..	15	..	..	..
15	Tennessee	15	..	..	..	15	..	..	..	..
21	Ohio	21	..	..	..	21	..	..	..	..
5	Louisiana	5	..	..	..	5	..	..	..	..
4	Mississippi	4	..	..	..	4	..	..	..	..
9	Indiana	9	..	..	..	9	..	..	..	..
5	Illinois	5	..	..	..	5	..	..	..	..
7	Alabama	7	..	..	..	7	..	..	..	..
4	Missouri	4	..	..	..	4	..	..	..	..
288	Whole number	219	49	11	7	189	49	30	11	7
	Necessary to elect, 145.									

ELECTION FOR THE THIRTEENTH TERM, COMMENCING 4 MARCH 1837 AND TERMINATING 3 MARCH 1841.

Number of electoral votes	States	President				Vice President				
		M. Van Buren, New York	W. H. Harrison, Ohio	Hugh L. White, Tennessee	Daniel Webster, Massachusetts	W. P. Mangum, North Carolina	R. M. Johnson, Kentucky	Francis Granger, New York	John Tyler, Virginia	William Smith, Alabama
10	Maine	10	..	..	..	..	10	..	..	..
7	New Hampshire	7	..	..	..	..	7	..	..	..
14	Massachusetts	..	..	..	14	..	..	14	..	..
4	Rhode Island	4	..	..	..	..	4	..	..	..
8	Connecticut	8	..	..	..	..	8	..	..	..
7	Vermont	..	7	..	..	..	..	7	..	..
42	New York	42	..	..	..	..	42	..	..	..
8	New Jersey	..	8	..	..	..	..	8	..	..
30	Pennsylvania	30	..	..	..	..	30	..	..	..
3	Delaware	..	3	..	..	..	..	3	..	..
10	Maryland	..	10	..	..	..	..	..	10	..
23	Virginia	23	..	..	..	..	..	..	..	23
15	North Carolina	15	..	..	..	..	15	..	..	..
11	South Carolina	..	..	..	..	11	..	..	11	..
11	Georgia	..	..	11	..	..	..	..	11	..
15	Kentucky	..	15	..	..	..	..	15	..	..
15	Tennessee	..	..	15	..	..	..	..	15	..
21	Ohio	..	21	..	..	..	..	21	..	..
5	Louisiana	5	..	..	..	..	5	..	..	..
4	Mississippi	4	..	..	..	..	4	..	..	..
9	Indiana	..	9	..	..	..	..	9	..	..
5	Illinois	5	..	..	..	..	5	..	..	..
7	Alabama	7	..	..	..	..	7	..	..	..
4	Missouri	4	..	..	..	..	4	..	..	..
3	Arkansas	3	..	..	..	..	3	..	..	..
3	Michigan	3	..	..	..	..	3	..	..	..
294	Whole number	170	73	26	14	11	* 147	77	47	23
	Necessary to elect, 148.									

* Elected by the Senate.

ELECTION FOR THE FOURTEENTH TERM, COMMENCING 4 MARCH 1841 AND TERMINATING 3 MARCH 1845.

Number of electoral votes	States	President		Vice President			
		W. H. Harrison, Ohio	M. Van Buren, New York	John Tyler, Virginia	R. M. Johnson, Kentucky	L. W. Tazewell, Virginia	James K. Polk, Tennessee
10	Maine	10	..	10	..	..	..
7	New Hampshire	..	7	..	7	..	..
14	Massachusetts	14	..	14	..	..	..
4	Rhode Island	4	..	4	..	..	..
8	Connecticut	8	..	8	..	..	..
7	Vermont	7	..	7	..	..	..
42	New York	42	..	42	..	..	..
8	New Jersey	8	..	8	..	..	..
30	Pennsylvania	30	..	30	..	..	..
3	Delaware	3	..	3	..	..	..
10	Maryland	10	..	10	..	..	..
23	Virginia	..	23	..	22	..	1
15	North Carolina	15	..	15	..	..	..
11	South Carolina	..	11	..	..	11	..
11	Georgia	11	..	11	..	..	..
15	Kentucky	15	..	15	..	..	..
15	Tennessee	15	..	15	..	..	..
21	Ohio	21	..	21	..	..	..
5	Louisiana	5	..	5	..	..	..
4	Mississippi	4	..	4	..	..	..
9	Indiana	9	..	9	..	..	..
5	Illinois	..	5	..	5	..	..
7	Alabama	..	7	..	7	..	..
4	Missouri	..	4	..	4	..	..
3	Arkansas	..	3	..	3	..	..
3	Michigan	3	..	3	..	..	..
294	Whole number.... Necessary to elect, 148	234	60	234	48	11	1

ELECTION FOR THE FIFTEENTH TERM, COMMENCING 4 MARCH 1845 AND TERMINATING 3 MARCH 1849.

Number of electoral votes	States	President		Vice President	
		James K. Polk, Tennessee	Henry Clay, Kentucky	Geo. M. Dallas, Pennsylvania	T. Frelinghuysen, New York
9	Maine	9	..	9	..
6	New Hampshire	6	..	6	..
12	Massachusetts	..	12	..	12
4	Rhode Island and Providence Plantations	..	4	..	4
6	Connecticut	..	6	..	6
6	Vermont	..	6	..	6
36	New York	36	..	36	..
7	New Jersey	..	7	..	7
26	Pennsylvania	26	..	26	..
3	Delaware	..	3	..	3
8	Maryland	..	8	..	8
17	Virginia	17	..	17	..
11	North Carolina	..	11	..	11
9	South Carolina	9	..	9	..
10	Georgia	10	..	10	..
12	Kentucky	..	12	..	12
13	Tennessee	..	13	..	13
23	Ohio	..	23	..	23
6	Louisiana	6	..	6	..
6	Mississippi	6	..	6	..
12	Indiana	12	..	12	..
9	Illinois	9	..	9	..
9	Alabama	9	..	9	..
7	Missouri	7	..	7	..
3	Arkansas	3	..	3	..
5	Michigan	5	..	5	..
275	Whole number .... Necessary to elect, 138.	170	105	170	105

ELECTION FOR THE SIXTEENTH TERM, COMMENCING 4 MARCH 1849 AND TERMINATING 3 MARCH 1853.

Number of electoral votes	States	President		Vice President	
		Z. Taylor, Louisiana	Lewis Cass, Michigan	M. Fillmore, New York	W. O. Butler, Kentucky
9	Maine	..	9	..	9
6	New Hampshire	..	6	..	6
12	Massachusetts	12	..	12	..
4	Rhode Island	4	..	4	..
6	Connecticut	6	..	6	..
6	Vermont	6	..	6	..
36	New York	36	..	36	..
7	New Jersey	7	..	7	..
26	Pennsylvania	26	..	26	..
3	Delaware	3	..	3	..
8	Maryland	8	..	8	..
17	Virginia	..	17	..	17
11	North Carolina	11	..	11	..
9	South Carolina	..	9	..	9
10	Georgia	10	..	10	..
12	Kentucky	12	..	12	..
13	Tennessee	13	..	13	..
23	Ohio	..	23	..	23
6	Louisiana	6	..	6	..
6	Mississippi	..	6	..	6
12	Indiana	..	12	..	12
9	Illinois	..	9	..	9
9	Alabama	..	9	..	9
7	Missouri	..	7	..	7
3	Arkansas	..	3	..	3
5	Michigan	..	5	..	5
3	Florida	3	..	3	..
4	Texas	..	4	..	4
4	Iowa	..	4	..	4
4	Wisconsin	..	4	..	4
290	Whole number. Necessary to elect, 146.	163	127	163	127

ELECTION FOR THE SEVENTEENTH TERM, COMMENCING 4 MARCH 1853 AND TERMINATING 3 MARCH 1857.

Number of electoral votes	States	President		Vice President	
		Franklin Pierce, New Hampshire	Winfield Scott, New Jersey	Wm. R. King, Alabama	W. A. Graham, North Carolina
8	Maine	8	..	8	..
5	New Hampshire	5	..	5	..
13	Massachusetts	..	13	..	13
4	Rhode Island and Providence Plantations	4	..	4	..
6	Connecticut	6	..	6	..
5	Vermont	..	5	..	5
35	New York	35	..	35	..
7	New Jersey	7	..	7	..
27	Pennsylvania	27	..	27	..
3	Delaware	3	..	3	..
8	Maryland	8	..	8	..
15	Virginia	15	..	15	..
10	North Carolina	10	..	10	..
8	South Carolina	8	..	8	..
10	Georgia	10	..	10	..
12	Kentucky	..	12	..	12
12	Tennessee	..	12	..	12
23	Ohio	23	..	23	..
6	Louisiana	6	..	6	..
7	Mississippi	7	..	7	..
13	Indiana	13	..	13	..
11	Illinois	11	..	11	..
9	Alabama	9	..	9	..
9	Missouri	9	..	9	..
4	Arkansas	4	..	4	..
6	Michigan	6	..	6	..
3	Florida	3	..	3	..
4	Texas	4	..	4	..
4	Iowa	4	..	4	..
5	Wisconsin	5	..	5	..
4	California	4	..	4	..
296	Whole number. Necessary to elect, 149.	254	42	254	42

ELECTION FOR THE EIGHTEENTH TERM, COMMENCING 4 MARCH 1857 AND TERMINATING 3 MARCH 1861.

Number of electoral votes	States	President			Vice President		
		Jas. Buchanan, Pennsylvania	J. C. Frémont, California	Mill. Fillmore, New York	J. C. Breckenridge, Kentucky	Wm. L. Dayton, New Jersey	A. J. Donelson, Tennessee
8	Maine	..	8	..	..	8	..
5	New Hampshire	..	5	..	..	5	..
13	Massachusetts	..	13	..	..	13	..
4	Rhode Island and Providence Plantations	..	4	..	..	4	..
6	Connecticut	..	6	..	..	6	..
5	Vermont	..	5	..	..	5	..
35	New York	..	35	..	..	35	..
7	New Jersey	7	..	..	7	..	..
27	Pennsylvania	27	..	..	27	..	..
3	Delaware	3	..	..	3	..	..
8	Maryland	..	..	8	..	..	8
15	Virginia	15	..	..	15	..	..
10	North Carolina	10	..	..	10	..	..
8	South Carolina	8	..	..	8	..	..
10	Georgia	10	..	..	10	..	..
12	Kentucky	12	..	..	12	..	..
12	Tennessee	12	..	..	12	..	..
23	Ohio	..	23	..	..	23	..
6	Louisiana	6	..	..	6	..	..
7	Mississippi	7	..	..	7	..	..
13	Indiana	13	..	..	13	..	..
11	Illinois	11	..	..	11	..	..
9	Alabama	9	..	..	9	..	..
9	Missouri	9	..	..	9	..	..
4	Arkansas	4	..	..	4	..	..
6	Michigan	..	6	..	..	6	..
3	Florida	3	..	..	3	..	..
4	Texas	4	..	..	4	..	..
4	Iowa	..	4	..	..	4	..
5	Wisconsin	..	5	..	..	5	..
4	California	4	..	..	4	..	..
296	Whole number. Necessary to elect, 149.	174	114	8	174	114	8

ELECTION FOR THE NINETEENTH TERM, COMMENCING 4 MARCH 1861 AND TERMINATING 3 MARCH 1865.

Number of electoral votes	States	President				Vice President			
		A. Lincoln, Illinois	J. C. Breckenridge, Ky.	John Bell, Tennessee	S. A. Douglas, Illinois	H. Hamlin, Maine	Jos. Lane, Oregon	Ed. Everett, Mass.	H. V. Johnson, Ga.
8	Maine	8	..	..	..	8	..	..	..
5	New Hampshire	5	..	..	..	5	..	..	..
13	Massachusetts	13	..	..	..	13	..	..	..
4	Rhode Island and Providence Plantations	4	..	..	..	4	..	..	..
6	Connecticut	6	..	..	..	6	..	..	..
5	Vermont	5	..	..	..	5	..	..	..
35	New York	35	..	..	..	35	..	..	..
7	New Jersey	4	..	..	3	4	..	..	3
27	Pennsylvania	27	..	..	..	27	..	..	..
3	Delaware	..	3	..	..	..	3	..	..
8	Maryland	..	8	..	..	..	8	..	..
15	Virginia	..	..	15	..	..	..	15	..
10	North Carolina	..	10	..	..	..	10	..	..
8	South Carolina	..	8	..	..	..	8	..	..
10	Georgia	..	10	..	..	..	10	..	..
12	Kentucky	..	..	12	..	..	..	12	..
12	Tennessee	..	..	12	..	..	..	12	..
23	Ohio	23	..	..	..	23	..	..	..
6	Louisiana	..	6	..	..	..	6	..	..
7	Mississippi	..	7	..	..	..	7	..	..
13	Indiana	13	..	..	..	13	..	..	..
11	Illinois	11	..	..	..	11	..	..	..
9	Alabama	..	9	..	..	..	9	..	..
9	Missouri	..	..	..	9	..	..	..	9
4	Arkansas	..	4	..	..	..	4	..	..
6	Michigan	6	..	..	..	6	..	..	..
3	Florida	..	3	..	..	..	3	..	..
4	Texas	..	4	..	..	..	4	..	..
4	Iowa	4	..	..	..	4	..	..	..
5	Wisconsin	5	..	..	..	5	..	..	..
4	California	4	..	..	..	4	..	..	..
4	Minnesota	4	..	..	..	4	..	..	..
3	Oregon	3	..	..	..	3	..	..	..
303	Whole number. Necessary to elect, 152.	180	72	39	12	180	72	39	12

ELECTION FOR THE TWENTIETH TERM, COMMENCING 4 MARCH 1865 AND TERMINATING 3 MARCH 1869.

Number of electoral votes	States	President		Vice President	
		A. Lincoln, Illinois	G. B. McClellan, New Jersey	A. Johnson, Tennessee	G. H. Pendleton, Ohio
7	Maine	7	..	7	..
5	New Hampshire	5	..	5	..
12	Massachusetts	12	..	12	..
4	Rhode Island	4	..	4	..
6	Connecticut	6	..	6	..
5	Vermont	5	..	5	..
33	New York	33	..	33	..
7	New Jersey	..	7	..	7
26	Pennsylvania	26	..	26	..
3	Delaware	..	3	..	3
7	Maryland	7	..	7	..
..	Virginia	..	..	..	..
..	North Carolina	..	..	..	..
..	South Carolina	..	..	..	..
..	Georgia	..	..	..	..
11	Kentucky	..	11	..	11
..	Tennessee	..	..	..	..
21	Ohio	21	..	21	..
..	Louisiana	..	..	..	..
..	Mississippi	..	..	..	..
13	Indiana	13	..	13	..
16	Illinois	16	..	16	..
..	Alabama	..	..	..	..
11	Missouri	11	..	11	..
..	Arkansas	..	..	..	..
8	Michigan	8	..	8	..
..	Florida	..	..	..	..
..	Texas	..	..	..	..
8	Iowa	8	..	8	..
8	Wisconsin	8	..	8	..
5	California	5	..	5	..
4	Minnesota	4	..	4	..
3	Oregon	3	..	3	..
3	Kansas	3	..	3	..
5	West Virginia	5	..	5	..
2	Nevada	2	..	2	..
233	Whole number	212	21	212	21
	Necessary to elect, 117.				

ELECTION FOR THE TWENTY-FIRST TERM, COMMENCING 4 MARCH 1869 AND TERMINATING 3 MARCH 1873.

Number of electoral votes	States	President		Vice President	
		U. S. Grant, Illinois	H. Seymour, New York	Schuyler Colfax, Indiana	F. P. Blair, Jr., Missouri
7	Maine	7	..	7	..
5	New Hampshire	5	..	5	..
12	Massachusetts	12	..	12	..
4	Rhode Island	4	..	4	..
6	Connecticut	6	..	6	..
5	Vermont	5	..	5	..
33	New York	..	33	..	33
7	New Jersey	..	7	..	7
26	Pennsylvania	26	..	26	..
3	Delaware	..	3	..	3
7	Maryland	..	7	..	7
..	Virginia	..	..	..	..
9	North Carolina	9	..	9	..
6	South Carolina	6	..	6	..
11	Kentucky	..	11	..	11
10	Tennessee	10	..	10	..
21	Ohio	21	..	21	..
7	Louisiana	..	7	..	7
..	Mississippi	..	..	..	..
13	Indiana	13	..	13	..
16	Illinois	16	..	16	..
8	Alabama	8	..	8	..
11	Missouri	11	..	11	..
5	Arkansas	5	..	5	..

ELECTION FOR THE TWENTY-FIRST TERM, COMMENCING 4 MARCH 1869 AND TERMINATING 3 MARCH 1873 — *Continued.*

Number of electoral votes	States	President		Vice President.	
		U. S. Grant, Illinois	H. Seymour, New York	Schuyler Colfax, Indiana	F. P. Blair, Jr., Missouri
8	Michigan	8	..	8	..
3	Florida	3	..	3	..
8	Iowa	8	..	8	..
8	Wisconsin	8	..	8	..
5	California	5	..	5	..
4	Minnesota	4	..	4	..
3	Oregon	..	3	..	3
3	Kansas	3	..	3	..
5	West Virginia	5	..	5	..
3	Nevada	3	..	3	..
3	Nebraska	3	..	3	..
285	Whole number of electors, excluding Georgia	214	71	214	71
9	Georgia	..	9	..	9
294	Whole number of electors. Necessary to elect, 148.	214	80	214	80

ELECTION FOR THE TWENTY-SECOND TERM, COMMENCING 4 MARCH 1873 AND TERMINATING 3 MARCH 1877.

Number of electoral votes	States	President						Vice President								
		U. S. Grant, Illinois	Horace Greeley, New York	B. G. Brown, Missouri	T. A. Hendricks Indiana	C. J. Jenkins, Georgia	David Davis, Illinois	Henry Wilson, Massachusetts	B. G. Brown, Missouri	N. P. Banks, Massachusetts	G. W. Julian, Indiana	A. H. Colquitt, Georgia	J. M. Palmer, Illinois	T. E. Bramlette, Kentucky	W. S. Groesbeck Ohio	W. B. Machen,
7	Maine	7	..	..	..	..	..	7	..	..	..	..	..	..	..	..
5	New Hampshire	5	..	..	..	..	..	5	..	..	..	..	..	..	..	..
13	Massachusetts	13	..	..	..	..	..	13	..	..	..	..	..	..	..	..
4	Rhode Island	4	..	..	..	..	..	4	..	..	..	..	..	..	..	..
6	Connecticut	6	..	..	..	..	..	6	..	..	..	..	..	..	..	..
5	Vermont	5	..	..	..	..	..	5	..	..	..	..	..	..	..	..
35	New York	35	..	..	..	..	..	35	..	..	..	..	..	..	..	..
9	New Jersey	9	..	..	..	..	..	9	..	..	..	..	..	..	..	..
29	Pennsylvania	29	..	..	..	..	..	29	..	..	..	..	..	..	..	..
3	Delaware	3	..	..	..	..	..	3	..	..	..	..	..	..	..	..
8	Maryland	..	..	..	8	..	..	..	8	..	..	..	..	..	..	..
11	Virginia	11	..	..	..	..	..	11	..	..	..	..	..	..	..	..
10	North Carolina	10	..	..	..	..	..	10	..	..	..	..	..	..	..	..
7	South Carolina	7	..	..	..	..	..	7	..	..	..	..	..	..	..	..
11	Georgia	..	*	6	..	2	..	..	5	1	..	5	..	..	..	..
12	Kentucky	..	..	4	8	..	..	..	8	..	..	..	..	3	..	1
12	Tennessee	..	..	..	12	..	..	..	12	..	..	..	..	..	..	..
22	Ohio	22	..	..	..	..	..	22	..	..	..	..	..	..	..	..
..	Louisiana	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	Indiana	15	..	..	..	..	..	15	..	..	..	..	..	..	..	..
8	Mississippi	8	..	..	..	..	..	8	..	..	..	..	..	..	..	..
21	Illinois	21	..	..	..	..	..	21	..	..	..	..	..	..	..	..
10	Alabama	10	..	..	..	..	..	10	..	..	..	..	..	..	..	..
15	Missouri	..	..	8	6	..	1	..	6	..	5	..	3	..	1	..
..	Arkansas	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
11	Michigan	11	..	..	..	..	..	11	..	..	..	..	..	..	..	..
4	Florida	4	..	..	..	..	..	4	..	..	..	..	..	..	..	..
8	Texas	..	..	..	8	..	..	..	8	..	..	..	..	..	..	..
10	Wisconsin	10	..	..	..	..	..	10	..	..	..	..	..	..	..	..
11	Iowa	11	..	..	..	..	..	11	..	..	..	..	..	..	..	..
6	California	6	..	..	..	..	..	6	..	..	..	..	..	..	..	..
5	Minnesota	5	..	..	..	..	..	5	..	..	..	..	..	..	..	..
3	Oregon	3	..	..	..	..	..	3	..	..	..	..	..	..	..	..
5	Kansas	5	..	..	..	..	..	5	..	..	..	..	..	..	..	..
5	West Virginia	5	..	..	..	..	..	5	..	..	..	..	..	..	..	..
3	Nevada	3	..	..	..	..	..	3	..	..	..	..	..	..	..	..
3	Nebraska	3	..	..	..	..	..	3	..	..	..	..	..	..	..	..
352	Whole number... Necessary to elect, 177.	286	..	18	42	2	1	286	47	1	5	5	3	3	1	1

*The votes of three electors from Georgia were returned for Horace Greeley; but as he had died before the votes were cast in the Electoral College, it was decided that they should not be counted.

ELECTION FOR THE TWENTY-THIRD TERM, COMMENCING 4 MARCH 1877 AND TERMINATING 3 MARCH 1881.

Number of electoral votes	States	President		Vice President	
		R. B. Hayes, Ohio	S. J. Tilden, New York	W. A. Wheeler, New York	T. A. Hendricks Indiana
10	Alabama	..	10	..	10
6	Arkansas	..	6	..	6
6	California	6	..	6	..
3	Colorado	3	..	3	..
6	Connecticut	..	6	..	6
3	Delaware	..	3	..	3
4	Florida	4	..	4	..
11	Georgia	..	11	..	11
21	Illinois	21	..	21	..
15	Indiana	..	15	..	15
11	Iowa	11	..	11	..
5	Kansas	5	..	5	..
12	Kentucky	..	12	..	12
8	Louisiana	8	..	8	..
7	Maine	7	..	7	..
8	Maryland	..	8	..	8
13	Massachusetts	13	..	13	..
11	Michigan	11	..	11	..
5	Minnesota	5	..	5	..
8	Mississippi	..	8	..	8
15	Missouri	..	15	..	15
3	Nebraska	3	..	3	..
3	Nevada	3	..	3	..
5	New Hampshire	5	..	5	..
9	New Jersey	..	9	..	9
35	New York	..	35	..	35
10	North Carolina	..	10	..	10
22	Ohio	22	..	22	..
3	Oregon	3	..	3	..
29	Pennsylvania	29	..	29	..
4	Rhode Island	4	..	4	..
7	South Carolina	7	..	7	..
12	Tennessee	..	12	..	12
8	Texas	..	8	..	8
5	Vermont	5	..	5	..
11	Virginia	..	11	..	11
5	West Virginia	..	5	..	5
10	Wisconsin	10	..	10	..
369	Whole number of electors..... Necessary to elect, 185.	185	184	185	184

The vote was canvassed and the result proclaimed by the Electoral Commission.

ELECTION FOR THE TWENTY-FOURTH TERM, COMMENCING 4 MARCH 1881 AND TERMINATING 3 MARCH 1885.

Number of electoral votes	States	President				Vice President			
		The vote of Georgia, cast on 8 Dec., second Wednesday of the month if counted		The vote of Georgia, cast on 8 Dec., second Wednesday of the month if not counted (See sec. 135 R. S.)		The vote of Georgia, cast on 8 Dec., second Wednesday of the month if counted		The vote of Georgia, cast on 8 Dec., second Wednesday of the month if not counted	
		Jas. A. Garfield, Ohio	W. S. Hancock, Pennsylvania	Jas. A. Garfield, Ohio	W. S. Hancock, Pennsylvania	C. A. Arthur, New York	W. H. English, Indiana	C. A. Arthur, New York	W. H. English, Indiana
10	Alabama	..	10	..	10	..	10	..	10
6	Arkansas	..	6	..	6	..	6	..	6
6	California	1	5	1	5	1	5	1	5
3	Colorado	3	..	3	..	3	..	3	..
6	Connecticut	6	..	6	..	6	..	6	..
3	Delaware	..	3	..	3	..	3	..	3
4	Florida	..	4	..	4	..	4	..	4
11	Georgia	..	11	..	..	..	11	..	..
21	Illinois	21	..	21	..	21	..	21	..
15	Indiana	15	..	15	..	15	..	15	..
11	Iowa	11	..	11	..	11	..	11	..
5	Kansas	5	..	5	..	5	..	5	..

ELECTION FOR THE TWENTY-FOURTH TERM — *Continued.*

Number of electoral votes	State	President				Vice President			
		Jas. A. Garfield, Ohio	W. S. Hancock, Pennsylvania	Jas. A. Garfield, Ohio	W. S. Hancock, Pennsylvania	C. A. Arthur, New York	W. H. English, Indiana	C. A. Arthur, New York	W. H. English, Indiana
12	Kentucky	..	12	..	12	..	12	..	12
8	Louisiana	..	8	..	8	..	8	..	8
7	Maine	7	..	7	..	7	..	7	..
8	Maryland	..	8	..	8	..	8	..	8
13	Massachusetts	15	..	13	..	13	..	13	..
11	Michigan	11	..	11	..	11	..	11	..
5	Minnesota	5	..	5	..	5	..	5	..
8	Mississippi	..	8	..	8	..	8	..	8
15	Missouri	..	15	..	15	..	15	..	15
3	Nebraska	3	..	3	..	3	..	3	..
3	Nevada	..	3	..	3	..	3	..	3
5	New Hampshire	5	..	5	..	5	..	5	..
9	New Jersey	..	9	..	9	..	9	..	9
35	New York	35	..	35	..	35	..	35	..
10	North Carolina	..	10	..	10	..	10	..	10
22	Ohio	22	..	22	..	22	..	22	..
3	Oregon	3	..	3	..	3	..	3	..
29	Pennsylvania	29	..	29	..	29	..	29	..
4	Rhode Island	4	..	4	..	4	..	4	..
7	South Carolina	..	7	..	7	..	7	..	7
12	Tennessee	..	12	..	12	..	12	..	12
8	Texas	..	8	..	8	..	8	..	8
5	Vermont	5	..	5	..	5	..	5	..
11	Virginia	..	11	..	11	..	11	..	11
5	West Virginia	..	5	..	5	..	5	..	5
10	Wisconsin	10	..	10	..	10	..	10	..
369	Whole number	214	155	214	144	214	155	214	144
	Necessary to elect, 185.								

ELECTION FOR THE TWENTY-FIFTH TERM, COMMENCING 4 MARCH 1885 AND TERMINATING 3 MARCH 1889.

Number of electoral votes	States	President		Vice President	
		G. Cleveland, New York	J. G. Blaine, Maine	T. A. Hendricks, Ind.	J. A. Logan, Illinois
10	Alabama	10	..	10	..
7	Arkansas	7	..	7	..
8	California	..	8	..	8
3	Colorado	..	3	..	3
6	Connecticut	6	..	6	..
3	Delaware	3	..	3	..
4	Florida	4	..	4	..
12	Georgia	12	..	12	..
22	Illinois	..	22	..	22
15	Indiana	15	..	15	..
13	Iowa	..	13	..	13
9	Kansas	..	9	..	9
13	Kentucky	13	..	13	..
8	Louisiana	8	..	8	..
6	Maine	..	6	..	6
8	Maryland	8	..	8	..
14	Massachusetts	..	14	..	14
13	Michigan	..	13	..	13
7	Minnesota	..	7	..	7
9	Mississippi	9	..	9	..
16	Missouri	16	..	16	..
5	Nebraska	..	5	..	5
3	Nevada	..	3	..	3
4	New Hampshire	..	4	..	4
9	New Jersey	9	..	9	..
36	New York	36	..	36	..
11	North Carolina	11	..	11	..
23	Ohio	..	23	..	23
3	Oregon	..	3	..	3
30	Pennsylvania	..	30	..	30
4	Rhode Island	..	4	..	4
9	South Carolina	9	..	9	..
12	Tennessee	12	..	12	..
13	Texas	13	..	13	..
4	Vermont	..	4	..	4
12	Virginia	12	..	12	..
6	West Virginia	6	..	6	..
11	Wisconsin	..	11	..	11
401	Whole number	219	182	219	182
	Necessary to elect, 202.				

ELECTION FOR THE TWENTY-SIXTH TERM, COMMENCING 4 MARCH 1889 AND TERMINATING 3 MARCH 1893.

Number of electoral votes	States	President		Vice President	
		Benj. Harrison, Indiana	G. Cleveland, New York	L. P. Morton, New York	A. G. Thurman, Ohio
10	Alabama	..	10	..	10
7	Arkansas	..	7	..	7
8	California	8	..	8	..
3	Colorado	3	..	3	..
6	Connecticut	..	6	..	6
3	Delaware	..	3	..	3
4	Florida	..	4	..	4
12	Georgia	..	12	..	12
22	Illinois	22	..	22	..
15	Indiana	15	..	15	..
13	Iowa	13	..	13	..
9	Kansas	9	..	9	..
13	Kentucky	..	13	..	13
8	Louisiana	..	8	..	8
6	Maine	6	..	6	..
8	Maryland	..	8	..	8
14	Massachusetts	14	..	14	..
13	Michigan	13	..	13	..
7	Minnesota	7	..	7	..
9	Mississippi	..	9	..	9
16	Missouri	..	16	..	16
5	Nebraska	5	..	5	..
3	Nevada	3	..	3	..
4	New Hampshire	4	..	4	..
9	New Jersey	..	9	..	9
36	New York	36	..	36	..
11	North Carolina	..	11	..	11
23	Ohio	23	..	23	..
3	Oregon	3	..	3	..
30	Pennsylvania	30	..	30	..
4	Rhode Island	4	..	4	..
9	South Carolina	..	9	..	9
12	Tennessee	..	12	..	12
13	Texas	..	13	..	13
4	Vermont	4	..	4	..
12	Virginia	..	12	..	12
6	West Virginia	..	6	..	6
11	Wisconsin	11	..	11	..
401	Whole number.... Necessary to elect, 202.	233	168	233	168

ELECTION FOR THE TWENTY-SEVENTH TERM, COMMENCING 4 MARCH 1893 AND TERMINATING 3 MARCH 1897.

Number of electoral votes	States	President			Vice President		
		G. Cleveland, New York	Benj. Harrison, Indiana	J. B. Weaver, Iowa	A. E. Stevenson, Illinois	Whitelaw Reid, New York	James G. Field, Virginia
11	Alabama	11	..	..	11	..	..
8	Arkansas	8	..	..	8	..	..
9	California	8	1	..	8	1	..
4	Colorado	..	..	4	..	..	4
6	Connecticut	6	..	..	6	..	..
3	Delaware	3	..	..	3	..	..
4	Florida	4	..	..	4	..	..
13	Georgia	13	..	..	13	..	..
3	Idaho	..	..	3	..	..	3
24	Illinois	24	..	..	24	..	..
15	Indiana	15	..	..	15	..	..
13	Iowa	..	13	..	..	13	..
10	Kansas	..	..	10	..	..	10
13	Kentucky	13	..	..	13	..	..
8	Louisiana	8	..	..	8	..	..
6	Maine	..	6	..	..	6	..
8	Maryland	8	..	..	8	..	..
15	Massachusetts	..	15	..	..	15	..
14	Michigan	5	9	..	5	9	..
9	Minnesota	..	9	..	..	9	..
9	Mississippi	9	..	..	9	..	..
17	Missouri	17	..	..	17	..	..
3	Montana	..	3	..	..	3	..
8	Nebraska	..	8	..	..	8	..
3	Nevada	..	..	3	..	..	3

ELECTION FOR THE TWENTY-SEVENTH TERM — *Continued.*

Number of electoral votes	States	President			Vice President		
		G. Cleveland, New York	Benj. Harrison, Indiana	J. B. Weaver, Iowa	A. E. Stevenson, Illinois	Whitelaw Reid, New York	James G. Field, Virginia
4	New Hampshire	..	4	..	..	4	..
10	New Jersey	10	..	..	10	..	..
36	New York	36	..	..	36	..	..
11	North Carolina	11	..	..	11	..	..
3	North Dakota	1	1	1	1	1	1
23	Ohio	1	22	..	1	22	..
4	Oregon	..	3	1	..	3	1
32	Pennsylvania	..	32	..	..	32	..
4	Rhode Island	..	4	..	..	4	..
9	South Carolina	9	..	..	9	..	..
4	South Dakota	..	4	..	..	4	..
12	Tennessee	12	..	..	12	..	..
15	Texas	15	..	..	15	..	..
4	Vermont	..	4	..	..	4	..
12	Virginia	12	..	..	12	..	..
4	Washington	..	4	..	..	4	..
6	West Virginia	6	..	..	6	..	..
12	Wisconsin	12	..	..	12	..	..
3	Wyoming	..	3	..	..	3	..
444	Whole number	277	145	22	277	145	22
	Necessary to elect, 223.						

ELECTION FOR THE TWENTY-EIGHTH TERM, COMMENCING 4 MARCH 1897 AND TERMINATING 3 MARCH 1901.

Number of electoral votes	States	President		Vice President		
		Wm. McKinley, Ohio.	W. J. Bryan, Nebraska	G. A. Hobart, New Jersey	A. Sewall, Maine	T. E. Watson, Georgia
11	Alabama	..	11	..	11	3
8	Arkansas	..	8	..	5	..
9	California	8	1	8	1	..
4	Colorado	..	4	..	4	..
6	Connecticut	6	..	6	..	..
3	Delaware	3	..	3	..	..
4	Florida	..	4	..	4	..
13	Georgia	..	13	..	13	..
3	Idaho	..	3	..	3	..
24	Illinois	24	..	24	..	..
15	Indiana	15	..	15	..	..
13	Iowa	13	..	13	..	..
10	Kansas	..	10	..	10	..
13	Kentucky	12	1	12	1	..
8	Louisiana	..	8	..	4	4
6	Maine	6	..	6	..	..
8	Maryland	8	..	8	..	..
15	Massachusetts	15	..	15	..	..
14	Michigan	14	..	14	..	..
9	Minnesota	9	..	9	..	..
9	Mississippi	..	9	..	9	..
17	Missouri	..	17	..	13	4
3	Montana	..	3	..	2	1
8	Nebraska	..	8	..	4	4
3	Nevada	..	3	..	3	..
4	New Hampshire	4	..	4	..	..
10	New Jersey	10	..	10	..	..
36	New York	36	..	36	..	..
11	North Carolina	..	11	..	6	5
3	North Dakota	3	..	3	..	..
23	Ohio	23	..	23	..	..
4	Oregon	4	..	4	..	..
32	Pennsylvania	32	..	32	..	..
4	Rhode Island	4	..	4	..	..
9	South Carolina	..	9	..	9	..
4	South Dakota	..	4	..	2	2
12	Tennessee	..	12	..	12	..
15	Texas	..	15	..	15	..
3	Utah	..	3	..	2	1
4	Vermont	4	..	4	..	..
12	Virginia	..	12	..	12	..
4	Washington	..	4	..	2	2
6	West Virginia	6	..	6	..	..
12	Wisconsin	12	..	12	..	..
3	Wyoming	..	3	..	2	1
447	Whole number	271	176	271	149	27
	Necessary to elect, 224.					

ELECTION FOR THE TWENTY-NINTH TERM, COMMENCING 4 MARCH 1901 AND TERMINATING 3 MARCH 1905.

Number of electoral votes	States	President		Vice President	
		Wm. McKinley, Ohio	Wm. J. Bryan, Nebraska	T. Roosevelt, New York	A.E. Stevenson, Illinois
11	Alabama	..	11	..	11
8	Arkansas	..	8	..	8
9	California	9	..	9	..
4	Colorado	..	4	..	4
6	Connecticut	6	..	6	..
3	Delaware	3	..	3	..
4	Florida	..	4	..	4
13	Georgia	..	13	..	13
3	Idaho	..	3	..	3
24	Illinois	24	..	24	..
15	Indiana	15	..	15	..
13	Iowa	13	..	13	..
10	Kansas	10	..	10	..
13	Kentucky	..	13	..	13
8	Louisiana	..	8	..	8
6	Maine	6	..	6	..
8	Maryland	8	..	8	..
15	Massachusetts	15	..	15	..
14	Michigan	14	..	14	..
9	Minnesota	9	..	9	..
9	Mississippi	..	9	..	9
17	Missouri	..	17	..	17
3	Montana	..	3	..	3
8	Nebraska	8	..	8	..
3	Nevada	..	3	..	3
4	New Hampshire	4	..	4	..
10	New Jersey	10	..	10	..
36	New York	36	..	36	..
11	North Carolina	..	11	..	11
3	North Dakota	3	..	3	..
23	Ohio	23	..	23	..
4	Oregon	4	..	4	..
32	Pennsylvania	32	..	32	..
4	Rhode Island	4	..	4	..
9	South Carolina	..	9	..	9
4	South Dakota	4	..	4	..
12	Tennessee	..	12	..	12
15	Texas	..	15	..	15
3	Utah	3	..	3	..
4	Vermont	4	..	4	..
12	Virginia	..	12	..	12
4	Washington	4	..	4	..
6	West Virginia	6	..	6	..
12	Wisconsin	12	..	12	..
3	Wyoming	3	..	3	..
447	Whole number Necessary to elect, 224.	292	155	292	155

ELECTION FOR THE THIRTIETH TERM, COMMENCING 4 MARCH 1905 AND TERMINATING 3 MARCH 1909.

Number of electoral votes	States	President		Vice-president	
		Theodore Roosevelt, New York	Alton B. Parker, New York	Charles W. Fairbanks, Indiana	Henry G. Davis, West Virginia
11	Alabama	..	11	..	11
9	Arkansas	..	9	..	9
10	California	10	..	10	..
5	Colorado	5	..	5	..
7	Connecticut	7	..	7	..
3	Delaware	3	..	3	..
	Florida	..	5	..	5
13	Georgia	..	13	..	13
3	Idaho	3	..	3	..
27	Illinois	27	..	27	..
15	Indiana	15	..	15	..
13	Iowa	13	..	13	..
10	Kansas	10	..	10	..
13	Kentucky	..	13	..	13
9	Louisiana	..	9	..	9
6	Maine	6	..	..	..

Number of electoral votes	States	President		Vice-President	
		Theodore Roosevelt, New York	Alton B. Parker, New York	Charles W. Fairbanks, Indiana	Henry G. Davis, West Virginia
8	Maryland	1	7	1	7
16	Massachusetts	16	..	16	..
14	Michigan	14	..	14	..
11	Minnesota	11	..	11	..
10	Mississippi	..	10	..	10
18	Missouri	18	..	18	..
3	Montana	3	..	3	..
8	Nebraska	8	..	8	..
3	Nevada	3	..	3	..
4	New Hampshire	4	..	4	..
12	New Jersey	12	..	12	..
39	New York	39	..	39	..
12	North Carolina	..	12	..	12
4	North Dakota	4	..	4	..
23	Ohio	23	..	23	..
4	Oregon	4	..	4	..
34	Pennsylvania	34	..	34	..
4	Rhode Island	4	..	..	..
9	South Carolina	..	9	4	9
4	South Dakota	4	..	4	..
12	Tennessee	..	12	..	12
18	Texas	..	18	..	18
3	Utah	3	..	3	..
4	Vermont	4	..	4	..
12	Virginia	..	12	..	12
5	Washington	5	..	5	..
7	West Virginia	7	..	7	..
13	Wisconsin	13	..	13	..
3	Wyoming	3	..	3	..
476	Whole number Necessary to elect, 239.	336	140	336	140

The popular vote received by the successful Presidential candidates is as follows, 1824–1904:

Year	Candidates	Total Vote
1824	A. Jackson	153 544
1828	A. Jackson	647.286
1832	A. Jackson	687.502
1836	M. Van Buren	762 678
1840	W. H. Harrison	1,275,016
1844	J. K. Polk	1,337,243
1848	Z. Taylor	1,360.099
1852	F. Pierce	1,602,274
1856	J. Buchanan	1,838,169
1860	A. Lincoln	1,866,452
1864	A. Lincoln	2,213,665
1868	U. S. Grant	3,012,833
1872	U. S. Grant	3,597,132
1876	R. B. Hayes	4.036,298
1880	J. A. Garfield	4,454,416
1884	G. Cleveland	4,874,986
1888	Benj. Harrison	5,439,853
1892	G. Cleveland	5,554,437
1896	W. McKinley	7,102,272
1900	W. McKinley	7,219,101
1904	T. Roosevelt	7.624,982

See also UNITED STATES — CABINET OFFICERS, SENATE PRESIDENTS AND PRINCIPAL FOREIGN MINISTERS OF; UNITED STATES — PRESIDENTIAL AND VICE-PRESIDENTIAL CANDIDATES.

ROBERT BRENT MOSHER,
Chief of the Bureau of Appointments, Department of State.

United States — Cabinet Officers, Senate Presidents and Principal Foreign Ministers of the. In the following pages will be found a complete list of the Presidents *pro tempore* of the Senate of the United States, the Speakers of the House of Representatives, the Chief Justices of the Supreme Court of the United States, and all cabinet officers, Secretaries of State, Secretaries of the Treasury, Secretaries of War, Attorneys General, Postmasters General, Secretaries of the Navy, Secretaries of the Interior, Secretaries of Agriculture, Secretaries of Commerce and Labor, and United States Ministers, Envoys Extraordinary, and *Chargés d'affaires* to Great Britain, Germany, France, and Russia.

Cong.	*Presidents* PRO TEM. *of the Senate*	*Speakers of the House of Representatives.*
1st	John Langdon, of N. H.	F. A. Muhlenberg, of Pa.
2d	Richard Henry Lee, of Va. John Langdon, of N. H.	Jonathan Trumbull, of Conn.
3d	Ralph Izard, of S. C. Henry Tazewell, of Va.	F. A. Muhlenberg, of Pa.
4th	Sam'l. Livermore of N.H William Bingham, of Pa.	Jonathan Dayton, of N. J.
5th	Wm. Bradford, of R. I. Jacob Read, of S. C. Theo. Sedgwick, of Mass. John Lawrence, of N. Y. James Ross, of Pa.	Jonathan Dayton, of N. J. George Dent, of Md., *pro tem.*
6th	Sam'l Livermore, of N.H. Uriah Tracy, of Conn. John E. Howard, of Md. Jas. Hillhouse, of Conn.	Theodore Sedgwick, of Mass. Nath'l Macon, of N. C.
7th	Abraham Baldwin, of Ga. Stephen R. Bradley, of Vt.	Nath'l Macon, of N. C.
8th	John Brown, of Ky. Jesse Franklin, of N. C. Jos. Anderson, of Tenn.	Nath'l Macon, of N. C.
9th	Samuel Smith, of Md.	Joseph B. Varnum, of Mass.
10th	Samuel Smith, of Md. Stephen R. Bradley, of Vt. John Milledge, of Ga.	

	Presidents PRO TEM. *of the Senate.*	*Speakers of the House of Representatives.*
11th	Andrew Gregg, of Pa. John Gaillard, of S. C. John Pope, of Ky.	Joseph B. Varnum, of Mass.
12th	Wm. H. Crawford, of Ga.	Henry Clay, of Ky.
13th	Joseph B. Varnum, of Mass. John Gaillard, of S. C.	Henry Clay, of Ky. Langdon Cheves, of S. C.
14th	John Gaillard, of S. C.	Henry Clay, of Ky.
15th	John Gaillard, of S. C. James Barbour, of Va.	Henry Clay, of Ky.
16th	James Barbour, of Va. John Gaillard, of S. C.	Henry Clay, of Ky. J. W. Taylor, of N. Y.
17th	John Gaillard, of S. C.	Philip P. Barbour, of Va.
18th	John Gaillard, of S. C.	Henry Clay, of Ky.
19th	John Gaillard, of S. C. Nathan'l. Macon, of N. C.	John W. Taylor, of N. Y.
20th	Nathan'l. Macon, of N. C. Samuel Smith, of Md.	Andrew Stevenson, of Va.
21st	Samuel Smith, of Md. Littleton W. Tazewell, of Va.	Andrew Stevenson, of Va.
22d	Littleton W. Tazewell, of Va. Hugh L. White, of Tenn.	Andrew Stevenson, of Va.
23d	Hugh L. White, of Tenn. Geo. Poindexter, of Miss. John Tyler, of Va.	Andrew Stevenson, of Va. John Bell, of Tenn. Henry Hubbard, of N. H., *pro tem.*
24th	Wm. R. King, of Ala.	Jas. K. Polk, of Tenn.
25th	Wm. R. King, of Ala.	Jas. K. Polk, of Tenn.
26th	Wm. R. King, of Ala.	R. M. T. Hunter, of Va.
27th	Samuel L. Southard, of N. J. Willie P. Mangum, of N. C.	John White, of Ky.
28th	Willie P. Mangum, of N. C.	John W. Jones, of Va. George W. Hopkins, of Va., *pro tem.*
29th	David R. Atchison, of Mo.	Jno. W. Davis, of Ind.
30th	David R. Atchison, of Mo.	John C. Winthrop, of Mass. Armisted Burt, of S. C., *pro tem.*
31st	David R. Atchison, of Mo. Wm. R. King, of Ala.	Howell Cobb, of Ga. Robt. C. Winthrop, of Mass., *pro tem.*
32d	Wm. R. King, of Ala. David R. Atchison, of Mo.	Linn Boyd, of Ky.
33d	David R. Atchison, of Mo. Lewis Cass, of Mich. Jesse D. Bright, of Ind.	Linn Boyd, of Ky.
34th	Jesse D. Bright, of Ind. Chas. E. Stuart, of Mich. Jas. M. Mason, of Va.	Nathaniel P. Banks, of Mass.
35th	Jas. M. Mason, of Va. Thos. J. Rusk, of Texas. Benj. Fitzpatrick, of Ala.	Jas. L. Orr, of S. C.
36th	Benj. Fitzpatrick, of Ala. Jesse D. Bright, of Ind. Solomon Foot, of Vt.	William Pennington, of N. J.
37th	Solomon Foot, of Vt.	Galusha A. Grow, of Pa.
38th	Solomon Foot, of Vt. Daniel Clark, of N. H.	Schuyler Colfax, of Ind.
39th	Lafayette S. Foster, of Conn. Benj. F. Wade, of Ohio.	Schuyler Colfax, of Ind.
40th	Benj. F. Wade, of Ohio.	Schuyler Colfax, of Ind. Theodore M. Pomeroy, of N. Y.
41st	Henry B. Anthony, of R. I.	Jas. G. Blaine, of Me.
42d	Henry B. Anthony, of R. I.	Jas. G. Blaine, of Me.
43d	Matthew H. Carpenter, of Wis. Henry B. Anthony, of R. I.	Jas. G. Blaine, of Me.
44th	Thos. W. Ferry, of Mich.	Michael C. Kerr, of Ind. Sam'l J. Randall, of Pa.
45th	Thos. W. Ferry, of Mich.	Sam'l J. Randall, of Pa.
46th	Allen G. Thurman, of O.	Sam'l J. Randall, of Pa.
47th	David Davis, of Ill.	J. Warren Keifer, of Ohio.
48th	Geo. F. Edmunds, of Vt.	Jno. G. Carlisle, of Ky.
49th	John Sherman, of Ohio John J. Ingalls, of Kan.	Jno. G. Carlisle, of Ky.
50th	John J. Ingalls, of Kan.	Jno. G. Carlisle, of Ky
51st	John J. Ingalls, of Kan. Chas. F. Manderson, of Neb.	Thos. B. Reed, of Me.
52d	Chas. F. Manderson, of Neb.	Chas. F. Crisp, of Ga.
53d	Isham G. Harris, of Tenn. Matt. W. Ransom, of N. C.	Chas. F. Crisp, of Ga.
54th	Wm. P. Frye, of Maine.	Thos. B. Reed, of Me.
55th	Wm. P. Frye, of Maine.	Thos. B. Reed, of Me.
56th	Wm. P. Frye, of Maine.	David B. Henderson, of Iowa.
57th	Wm. P. Frye, of Maine.	David B. Henderson, of Iowa.
58th	Wm. P. Frye, of Maine.	Jos. G. Cannon, of Ill.

CHIEF JUSTICES OF THE UNITED STATES.

John Jay, of New York	Sept. 26,	1789
John Rutledge, of South Carolina	July 1,	1795
Oliver Ellsworth, of Connecticut	Mar. 4,	1796
John Marshall, of Virginia	Jan. 31,	1801
Roger B. Taney, of Maryland	Mar. 15,	1836
Salmon P. Chase, of Ohio	Dec. 6,	1864
Morrison R. Waite, of Ohio	Jan. 21,	1874
Melville W. Fuller, of Illinois	July 20,	1888

SECRETARIES OF STATE.

	Commissioned
John Jay, of New York, *ad interim*	
..... Continued until Jefferson took charge	
Thomas Jefferson, of Virginia	Sept. 26, 1789
Edmund Randolph, of Virginia	Jan. 2, 1794
Timothy Pickering, (Secretary of War), *ad interim*	Aug. 20, 1795
Timothy Pickering of Pennsylvania	Dec. 10, 1795
Chas. Lee (Attorney General), *ad interim*	May 13, 1800
John Marshall, of Virginia	May 13, 1800
Samuel Dexter (Secretary of the Treasury), "*pro hac vice*"	Jan. 31, 1801
John Marshall (Chief Justice, *ad interim*	Feb. 4, 1801
Levi Lincoln (Attorney General), *ad interim*	Mar. 5, 1801
James Madison, of Virginia	Mar. 5, 1801
Robert Smith, of Maryland	Mar. 6, 1809
James Monroe, of Virginia	April 2, 1811
James Monroe (Secretary of War), *ad interim*	Oct. 1, 1814
James Monroe, of Virginia	Feb. 28, 1815
John Graham (Chief Clerk), *ad interim*	Mar. 4, 1817
John Quincy Adams, of Massachusetts	Mar. 5, 1817
Richard Rush (Attorney General), *ad interim*	Mar. 10, 1817
Daniel Brent (Chief Clerk), *ad interim*	Mar. 4, 1825
Henry Clay, of Kentucky	Mar. 7, 1825
J. A. Hamilton, of New York, *ad interim*	Mar. 4, 1829
Martin Van Buren, of New York	Mar. 6, 1829
Edward Livingston, of Louisiana	May 24, 1831
Louis McLane, of Delaware	May 29, 1833
John Forsyth, of Georgia	June 27, 1834
J. L. Martin (Chief Clerk), *ad interim*	Mar. 4, 1841
Daniel Webster, of Massachusetts	Mar. 5, 1841
Hugh S. Legaré (Attorney General), *ad interim*	May 9, 1843
William S. Derrick (Chief Clerk), *ad interim*	June 21, 1843
Abel P. Upshur (Secretary of the Navy) *ad interim*	June 24, 1843
Abel P. Upshur, of Virginia	July 24, 1843
John Nelson (Attorney General), *ad interim*	Feb. 29, 1844
John C. Calhoun, of South Carolina	Mar. 6, 1844
James Buchanan, of Pennsylvania	Mar. 6, 1845
John M. Clayton, of Delaware	Mar. 7, 1849
Daniel Webster, of Massachusetts	July 22, 1850
Charles M. Conrad (Secretary of War), *ad interim*	Oct. 25, 1852
Edward Everett, of Massachusetts	Nov. 6, 1852
William Hunter (Chief Clerk), *ad interim*	Mar. 4, 1853
William L. Marcy, of New York	Mar. 7, 1853
Lewis Cass, of Michigan	Mar. 6, 1857
	Commissioned
William Hunter (Chief Clerk), *ad interim*	Dec. 15, 1860
Jeremiah S. Black, of Pennsylvania	Dec. 17, 1860
William H. Seward, of New York	Mar. 5, 1861
Elihu B. Washburne, of Illinois	Mar. 5, 1869
Hamilton Fish, of New York	Mar. 11, 1869
William M. Evarts, of New York	Mar. 12, 1877
James G. Blaine, of Maine	Mar. 5, 1881
Fred'k. T. Frelinghuysen, of New Jersey	Dec. 12, 1881
Thomas F. Bayard, of Delaware	Mar. 6, 1885

SECRETARIES OF STATE.

	Commissioned
James G. Blaine, of Maine	Mar. 5, 1889
William F. Wharton (Assistant Secretary), *ad interim*	June 5, 1892
John W. Foster, of Indiana	June 29, 1892
William F. Wharton (Assistant Secretary), *ad interim*	Feb. 23, 1893
Walter Q. Gresham, of Illinois	Mar. 6, 1893
Edwin F. Uhl (Assistant Secretary), *ad interim*	May 28, 1895
Alvey A. Adee (Second Assistant Secretary), *ad interim*	May 31, 1895
Edwin F. Uhl (Assistant Secretary), *ad interim*	June 1, 1895
Richard Olney, of Massachusetts	June 8, 1895
John Sherman, of Ohio	Mar. 5, 1897
William R. Day, of Ohio	April 26, 1898
Alvey A. Adee (Second Assist. Sec.)	Sept. 17, 1898
John Hay, of the District of Columbia	Sept. 20, 1898
Elihu Root, of New York	July 19, 1905

SECRETARIES OF THE TREASURY.

	Commissioned
Alexander Hamilton, of New York	Sept. 11, 1789
Oliver Wolcott, Jr., of Connecticut	Feb. 2, 1795
Samuel Dexter, of Massachusetts	Jan. 1, 1801
Albert Gallatin, of Pennsylvania	May 14, 1801
William Jones (Secretary of the Navy), *ad interim*	April 21, 1813
George W. Campbell, of Tennessee	Feb. 9, 1814
Alexander J. Dallas, of Pennsylvania	Oct. 6, 1814
William H. Crawford, of Georgia	Oct. 22, 1816
Samuel L. Southard (Secretary of the Navy), *ad interim*	Mar. 7, 1825
Richard Rush, of Pennsylvania	Mar. 7, 1825
Samuel D. Ingham, of Pennsylvania	Mar. 6, 1829
Ashury Dickins (Chief Clerk), *ad interim*	June 21, 1831
Louis McLane, of Delaware	Aug. 8, 1831
William J. Duane, of Pennsylvania	May 29, 1833
Roger B. Taney, of Maryland	Sept. 23, 1833
McClintock Young (Chief Clerk), *ad interim*	June 25, 1834
Levi Woodbury, of New Hampshire	June 27, 1834
McClintock Young (Chief Clerk), *ad interim*	Mar. 4, 1841
Thomas Ewing, of Ohio	Mar. 5, 1841
McClintock Young (Chief Clerk), *ad interim*	Sept. 13, 1841
Walter Forward, of Pennsylvania	Sept. 13, 1841
McClintock Young (Chief Clerk), *ad interim*	Mar. 1, 1843
John C. Spencer, of New York	Mar. 3, 1843
McClintock Young (Chief Clerk), *ad interim*	May 2, 1844
George M. Bibb, of Kentucky	June 15, 1844
Robert J. Walker, of Mississippi	Mar. 6, 1845
McClintock Young (Chief Clerk), *ad interim*	Mar. 6, 1849
William M. Meredith, of Pennsylvania	Mar. 8, 1849
Thomas Corwin, of Ohio	July 23, 1850
James Guthrie, of Kentucky	Mar. 7, 1853
Howell Cobb, of Georgia	Mar. 6, 1857
Isaac Toucey (Secretary of the Navy), *ad interim*	Dec. 10, 1860
Philip F. Thomas, of Maryland	Dec. 12, 1860
John A. Dix, of New York	Jan. 11, 1861
Salmon P. Chase, of Ohio	Mar. 5, 1861
George Harrington (Assistant Secretary), *ad interim*	July 1, 1864
William P. Fessenden, of Maine	July 1, 1864
George Harrington (Assistant Secretary), *ad interim*	Mar. 4, 1865
Hugh McCulloch, of Indiana	Mar. 7, 1865
John F. Hartley (Assistant Secretary), *ad interim*	Mar. 5, 1869
George S. Boutwell, of Massachusetts	Mar. 11, 1869
William A. Richardson, of Massachusetts	Mar. 17, 1873
Benjamin H. Bristow, of Kentucky	June 2, 1874
Charles F. Conant (Assistant Secretary), *ad interim*	June 21, 1876
Lot M. Morrill, of Maine	June 21, 1876
John Sherman, of Ohio	Mar. 8, 1877
Henry F. French (Assistant Secretary), *ad interim*	Mar. 4, 1881
William Windom, of Minnesota	Mar. 5, 1881
Charles J. Folger, of New York	Oct. 27, 1881
Charles E. Coon (Assistant Secretary), *ad interim*	Sept. 4, 1884
Henry F. French (Assistant Secretary) *ad interim*	Sept. 8, 1884
Charles E. Coon (Assistant Secretary), *ad interim*	Sept. 15, 1884
Walter Q. Gresham, of Indiana	Sept. 24, 1884
Hugh McCulloch, of Indiana	Oct. 28, 1884
Henry F. French (Assistant Secretary), *ad interim*	Oct. 30, 1884
Daniel Manning, of New York	Mar. 6, 1885
Charles S. Fairchild, of New York	April 1, 1887
William Windom, of Minnesota	Mar. 5, 1889

SECRETARIES OF THE TREASURY.

	Commissioned
Allured B. Nettleton (Assistant Secretary), *ad interim*	Jan. 30, 1891
Charles Foster, of Ohio	Feb. 24, 1891
John G. Carlisle, of Kentucky	Mar. 6, 1893
Lyman J. Gage, of Illinois	Mar. 5, 1897
Leslie M. Shaw, of Iowa	Jan. 9, 1902

SECRETARIES OF WAR.

	Commissioned
Henry Knox, of Massachusetts	Sept. 12, 1789
Timothy Pickering, of Pennsylvania	Jan. 2, 1795
James McHenry, of Maryland	Jan. 27, 1796
Samuel Dexter, of Massachusetts	May 13, 1800
Benjamin Stoddert (Secretary of the Navy), *ad interim*	June 1, 1800
Samuel Dexter (Secretary of the Treasury), *ad interim*	Jan. 1, 1801
Henry Dearborn, of Massachusetts	Mar. 5, 1801
John Smith (Chief Clerk), *ad interim*	Feb. 17, 1809
William Eustis, of Massachusetts	Mar. 7, 1809
James Monroe (Secretary of State), *ad interim*	Jan. 1, 1813
John Armstrong, of New York	Jan. 13, 1813
James Monroe (Secretary of State), *ad interim*	Aug. 30, 1814
James Monroe, of Virginia	Sept. 27, 1814
James Monroe (Secretary of State), *ad interim*	Mar. 1, 1815
Alexander J. Dallas (Secretary of the Treasury), *ad interim*	Mar. 14, 1815
William H. Crawford, of Georgia	Aug. 1, 1815
George Graham (Chief Clerk), *ad interim*	Oct. 22, 1816
John C. Calhoun, of South Carolina	Oct. 8, 1817
James Barbour, of Virginia	Mar. 7, 1825
Samuel L. Southard (Secretary of the Navy), *ad interim*	May 26, 1828
Peter B. Porter, of New York	May 26, 1828
John H. Eaton, of Tennessee	Mar. 9, 1829
Philip G. Randolph (Chief Clerk), *ad interim*	June 20, 1831
Roger B. Taney (Attorney General), *ad interim*	July 21, 1831
Lewis Cass, of Ohio	Aug. 1, 1831
Carey A. Harris (Commissioner of Indian Affairs), *ad interim*	Oct. 5, 1836
Benjamin F. Butler (Attorney General), *ad interim*	Oct. 26, 1836
Joel R. Poinsett, of South Carolina	Mar. 7, 1837
John Bell, of Tennessee	Mar. 5, 1841
Albert M. Lea (Chief Clerk), *ad interim*	Sept. 12, 1841
John C. Spencer, of New York	Oct. 12, 1841
James M. Porter, of Pennsylvania	Mar. 8, 1843
William Wilkins, of Pennsylvania	Feb. 15, 1844
William L. Marcy, of New York	Mar. 6, 1845
Reverdy Johnson (Attorney General), *ad interim*	Mar. 8, 1849
George W. Crawford, of Georgia	Mar. 8, 1849
Samuel J. Anderson (Chief Clerk), *ad interim*	July 23, 1850
Winfield Scott (Major General, U. S. A.), *ad interim*	July 24, 1850
Charles M. Conrad, of Louisiana	Aug. 15, 1850
Jefferson Davis, of Mississippi	Mar. 7, 1853
Samuel Cooper (Adjutant General U. S. A.), *ad interim*	Mar. 3, 1857
John B. Floyd, of Virginia	Mar. 6, 1857
Joseph Holt (Postmaster General), *ad interim*	Jan. 1, 1861
Joseph Holt, of Kentucky	Jan. 18, 1861
Simon Cameron, of Pennsylvania	Mar. 5, 1861
Edwin M. Stanton, of Pennsylvania	Jan. 15, 1862
Ulysses S. Grant (General of the Army), *ad interim*	Aug. 12, 1867
Edwin M. Stanton, of Pennsylvania, reinstated	Jan. 13, 1868
Lorenzo Thomas (Adjutant General, U. S. A.), *ad interim*	Feb. 21, 1868
John M. Schofield	May 28, 1868
John A. Rawlins, of Illinois	Mar. 11, 1869
William T. Sherman, of Ohio	Sept. 9, 1869
William W. Belknap, of Iowa	Oct. 25, 1869
George M. Robeson (Secretary of the Navy), *ad interim*	Mar. 2, 1876
Alphonso Taft, of Ohio	Mar. 8, 1876
James D. Cameron, of Pennsylvania	May 22, 1876
George W. McCrary, of Iowa	Mar. 12, 1877
Alexander Ramsey, of Minnesota	Dec. 10, 1879
Robert T. Lincoln, of Illinois	Mar. 5, 1881
William C. Endicott, of Massachusetts	Mar. 6, 1885
Redfield Proctor, of Vermont	Mar. 5, 1889
Lewis A. Grant (Assistant Secretary), *ad interim*	Dec. 6, 1891
Stephen B. Elkins, of West Virginia	Dec. 22, 1891
Daniel S. Lamont, of New York	Mar. 6, 1893
Russell A. Alger, of Michigan	Mar. 5, 1897
Elihu Root, of New York	Aug. 1, 1899
William H. Taft, of Ohio	Jan. 11, 1904

UNITED STATES — LISTS OF IMPORTANT OFFICERS

ATTORNEYS GENERAL.

	Commissioned
Edmund Randolph, of Virginia	Sept. 26, 1789
William Bradford, of Pennsylvania	Jan. 27, 1794
Charles Lee, of Virginia	Dec. 10, 1795
Levi Lincoln, of Massachusetts	Mar. 5, 1801
John Breckenridge, of Kentucky	Aug. 7, 1805
Cæsar A. Rodney, of Pennsylvania	Jan. 20, 1807
William Pinkney, of Maryland	Dec. 11, 1811
Richard Rush, of Pennsylvania	Feb. 10, 1814
William Wirt, of Virginia	Nov. 13, 1817
John M. Berrien, of Georgia	Mar. 9, 1829
Roger B. Taney, of Maryland	July 20, 1831
Benjamin F. Butler, of New York	Nov. 15, 1833
Felix Grundy, of Tennessee	July 5, 1838
Henry D. Gilpin, of Pennsylvania	Jan. 11, 1840
John J. Crittenden, of Kentucky	Mar. 5, 1841
Hugh S. Legaré, of South Carolina	Sept. 13, 1841
John Nelson, of Maryland	July 1, 1843
John Y. Mason, of Virginia	Mar. 6, 1845
Nathan Clifford, of Maine	Oct. 17, 1846
Isaac Toucey, of Connecticut	June 21, 1848
Reverdy Johnson, of Maryland	Mar. 8, 1849
John J. Crittenden, of Kentucky	July 22, 1850
Caleb Cushing, of Massachusetts	Mar. 7, 1853
Jeremiah S. Black, of Pennsylvania	Mar. 6, 1857
Edwin M. Stanton, of Pennsylvania	Dec. 20, 1860
Edward Bates, of Missouri	Mar. 5, 1861
James Speed, of Kentucky	Dec. 2, 1864
J. Hubley Ashton (Assistant Attorney General), Acting	July 17, 1866
Henry Stanbery, of Ohio	July 23, 1866
Orville H. Browning (Secretary of the Interior), Acting	Mar. 13, 1868
William M. Evarts, of New York	July 15, 1868
J. Hubley Ashton (Assistant Attorney General), Acting	Mar. 5, 1869
Ebenezer R. Hoar, of Massachusetts	Mar. 5, 1869
Amos T. Akerman, of Georgia	June 23, 1870
George H. Williams, of Oregon	Dec. 14, 1871
Edwards Pierrepont, of New York	April 26, 1875
Alphonso Taft, of Ohio	May 22, 1876
Charles Devens, of Massachusetts	Mar. 12, 1877
Wayne MacVeagh, of Pennsylvania	Mar. 5, 1881
Samuel F. Phillips (Solicitor General), *ad interim*	Nov. 14, 1881
Benjamin H. Brewster, of Pennsylvania	Dec. 19, 1881
Augustus H. Garland, of Arkansas	Mar. 6, 1885
William H. H. Miller, of Indiana	Mar. 5, 1889
Richard Olney, of Massachusetts	Mar. 6, 1893
Judson Harmon, of Ohio	June 8, 1895
Joseph McKenna, of California	Mar. 5, 1897
John W. Griggs, of New Jersey	Jan. 25, 1898
John K. Richards (Solicitor General), *ad interim*	Jan. 26, 1898
John K. Richards (Solicitor General), *ad interim*	April 1, 1901
Philander C. Knox, of Pennsylvania	April 5, 1901
William H. Moody, of Massachusetts	July 1, 1904

POSTMASTERS GENERAL.

Samuel Osgood, of Massachusetts	Sept. 26, 1789
Timothy Pickering, of Pennsylvania	Aug. 12, 1791
Joseph Habersham, of Georgia	Feb. 25, 1795
Gideon Granger, of Connecticut	Nov. 28, 1801
Return J. Meigs, Jr., of Ohio	Mar. 17, 1814
John McLean, of Ohio	June 26, 1823
William T. Barry, of Kentucky	Mar. 9, 1829
Amos Kendall, of Kentucky	May 1, 1835
John M. Niles, of Connecticut	May 19, 1840
Selah R. Hobbie (First Assistant Postmaster General), *ad interim*	Mar. 4, 1841
Francis Granger, of New York	Mar. 6, 1841
Charles A. Wickliffe, of Kentucky	Sept. 13, 1841
Selah R. Hobbie (First Assistant Postmaster General), *ad interim*	Sept. 14, 1841
Cave Johnson, of Tennessee	Mar. 6, 1845
Selah R. Hobbie (First Assistant Postmaster General), *ad interim*	Mar. 6, 1849
Jacob Collamer, of Vermont	Mar. 8, 1849
Nathan K. Hall, of New York	July 23, 1850
Samuel D. Hubbard, of Connecticut	Aug. 31, 1852
James Campbell, of Pennsylvania	Mar. 7, 1853
Aaron V. Brown, of Tennessee	Mar. 6, 1857
Horatio King (First Assistant Postmaster General), *ad interim*	Mar. 9, 1859
Joseph Holt, of Kentucky	Mar. 14, 1859
Horatio King (First Assistant Postmaster General), *ad interim*	Jan. 1, 1861
Horatio King, of Maine	Feb. 12, 1861
Montgomery Blair, of the District of Columbia	Mar. 5, 1861
William Dennison, of Ohio	Sept. 24, 1864
Alexander W. Randall (First Assistant Postmaster General), *ad interim*	July 17, 1866
Alexander W. Randall, of Wisconsin	July 25, 1866
St. John B. L. Skinner (First Assistant Postmaster General), *ad interim*	Mar. 4, 1869
John A. J. Creswell, of Maryland	Mar. 5, 1869
James W. Marshall, of Virginia	July 3, 1874

POSTMASTERS GENERAL.

	Commissioned
Marshall Jewell, of Connecticut	Aug. 24, 1874
James N. Tyner, of Indiana	July 12, 1876
David M. Key, of Tennessee	Mar. 12, 1877
Horace Maynard, of Tennessee	June 2, 1880
Thomas L. James, of New York	Mar. 5, 1881
Timothy O. Howe, of Wisconsin	Dec. 20, 1881
Frank Hatton (First Assistant Postmaster General), *ad interim*	Mar. 26, 1883
Walter Q. Gresham, of Indiana	April 3, 1883
Frank Hatton (First Assistant Postmaster General), *ad interim*	Sept. 25, 1884
Frank Hatton, of Iowa	Oct. 14, 1884
William F. Vilas, of Wisconsin	Mar. 6, 1885
Don M. Dickinson, of Michigan	Jan. 16, 1888
John Wanamaker, of Pennsylvania	Mar. 5, 1889
Wilson S. Bissell, of New York	Mar. 6, 1893
William L. Wilson, of West Virginia	Mar. 1, 1895
James A. Gary, of Maryland	Mar. 5, 1897
Charles Emory Smith, of Pennsylvania	April 21, 1898
Henry C. Payne, of Wisconsin	Jan. 9, 1902
Robert J. Wynne, of District of Columbia	Oct. 10, 1904
George B. Cortelyou, of New York	Mar. 6, 1905

SECRETARIES OF THE NAVY.

Benjamin Stoddert, of Maryland	May 21, 1798
Henry Dearborn (Sec'y War), *ad interim*	April 1, 1801
General Samuel Smith (member of Congress), in charge for Dearborn from	Mar. 31, 1801
Robert Smith, of Maryland	July 15, 1801
Paul Hamilton, of South Carolina	Mar. 7, 1809
Charles W. Goldsborough (Chief Clerk), *ad interim*	Mar. 8, 1809
Charles W. Goldsborough (Chief Clerk), *ad interim*	Jan. 7, 1813
William Jones, of Pennsylvania	Jan. 12, 1813
Benjamin Homans (Chief Clerk), *ad interim*	Dec. 2, 1814
Benjamin W. Crowninshield, of Massachusetts	Dec. 19, 1814
John C. Calhoun (Secretary of War), *ad interim*	Oct. 19, 1818
Smith Thompson, of New York	Nov. 9, 1818
John Rodgers (Commodore, U. S. N.), *ad interim*	Sept. 1, 1823
Samuel L. Southard, of New Jersey	Sept. 16, 1823
Charles Hay (Chief Clerk), *ad interim*	Mar. 4, 1829
John Branch, of North Carolina	Mar. 9, 1829
John Boyle (Chief Clerk), *ad interim*	May 12, 1831
Levi Woodbury, of New Hampshire	May 23, 1831
Mahlon Dickerson, of New Jersey	June 30, 1834
James K. Paulding, of New York	June 25, 1838
John D. Simms (Chief Clerk), *ad interim*	Mar. 4, 1841
George E. Badger, of North Carolina	Mar. 5, 1841
John D. Simms (Chief Clerk), *ad interim*	Sept. 11, 1841
Abel P. Upshur, of Virginia	Sept. 13, 1841
David Henshaw, of Massachusetts	July 24, 1843
Thomas W. Gilmer, of Virginia	Feb. 15, 1844
Lewis Warrington (Captain, U. S. N.), *ad interim*	Feb. 29, 1844
John Y. Mason, of Virginia	Mar. 14, 1844
George Bancroft, of Massachusetts	Mar. 10, 1845
John Y. Mason, of Virginia	Sept. 9, 1846
William B. Preston, of Virginia	Mar. 8, 1849
William A. Graham, of North Carolina	July 22, 1850
Lewis Warrington (Captain, U. S. N.), *ad interim*	July 23, 1850
John P. Kennedy, of Maryland	July 22, 1852
James C. Dobbin, of North Carolina	Mar. 7, 1853
Isaac Toucey, of Connecticut	Mar. 6, 1857
Gideon Welles, of Connecticut	Mar. 5, 1861
William Faxon (Assistant Secretary), *ad interim*	Mar. 4, 1869
Adolph E. Borie, of Pennsylvania	Mar. 5, 1869
George M. Robeson, of New Jersey	June 25, 1869
Richard W. Thompson, of Indiana	Mar. 12, 1877
Alexander Ramsey (Secretary of War), *ad interim*	Dec. 20, 1880
Nathan Goff, Jr., of West Virginia	Jan. 6, 1881
William H. Hunt, of Louisiana	Mar. 5, 1881
William E. Chandler, of New Hampshire	April 12, 1882
William C. Whitney, of New York	Mar. 6, 1885
Benjamin F. Tracy, of New York	Mar. 5, 1889
Hilary A. Herbert, of Alabama	Mar. 6, 1893
John D. Long, of Massachusetts	Mar. 5, 1897
William H. Moody, of Massachusetts	April 29, 1902
Paul Morton, of Illinois	July 1, 1904
Charles J. Bonaparte, of Maryland	July 1, 1905

SECRETARIES OF THE INTERIOR.

Thomas Ewing, of Ohio	Mar. 8, 1849
Daniel C. Goddard (Chief Clerk), *ad interim*	July 23, 1850
Thos. M. T. McKennan, of Pennsylvania	Aug. 15, 1850
Daniel C. Goddard (Chief Clerk), *ad interim*	Aug. 27, 1850
Alexander H. H. Stuart, of Virginia	Sept. 12, 1850
Robert McClelland, of Michigan	Mar. 7, 1853
Jacob Thompson, of Mississippi	Mar. 6, 1857
Moses Kelly (Chief Clerk), *ad interim*	Jan. 10, 1861
Caleb B. Smith, of Indiana	Mar. 5, 1861

UNITED STATES — LISTS OF IMPORTANT OFFICERS

SECRETARIES OF THE INTERIOR.

	Commissioned
John P. Usher (Assistant Secretary), *ad interim*	Jan. 1, 1863
John P. Usher, of Indiana	Jan. 8, 1863
James Harlan, of Iowa	May 15, 1865
Orville H. Browning, of Illinois	July 27, 1866
William T. Otto (Assistant Secretary), *ad interim*	Mar. 4, 1869
Jacob D. Cox, of Ohio	Mar. 5, 1869
Columbus Delano, of Ohio	Nov. 1, 1870
Benjamin R. Cowen (Assistant Secretary), *ad interim*	Oct. 1, 1875
Zachariah Chandler, of Michigan	Oct. 19, 1875
Carl Schurz, of Missouri	Mar. 12, 1877
Samuel J. Kirkwood, of Iowa	Mar. 5, 1881
Henry M. Teller, of Colorado	April 6, 1882
Merritt L. Joccelyn (Assistant Secretary), *ad interim*	Mar. 4, 1885
Lucius Q. C. Lamar, of Mississippi	Mar. 6, 1885
Henry L. Muldrow (Assistant Secretary), *ad interim*	Jan. 11, 1888
William F. Vilas, of Wisconsin	Jan. 16, 1888
John W. Noble, of Missouri	Mar. 5, 1889
Hoke Smith, of Georgia	Mar. 6, 1893
John M. Reynolds (Asst. Secretary), *ad interim*	Sept. 1, 1896
David R. Francis, of Missouri	Sept. 1, 1896
Cornelius N. Bliss, of New York	Mar. 5, 1897
Ethan A. Hitchcock, of Missouri	Dec. 21, 1898

SECRETARIES OF AGRICULTURE.

Norman J. Colman, of Missouri	Feb.	13, 1889
Jeremiah M. Rusk, of Wisconsin	Mar.	5, 1889
Julius Sterling Morton, of Nebraska	Mar.	6, 1893
James Wilson, of Iowa	Mar.	5, 1897

SECRETARIES OF COMMERCE AND LABOR.

George B. Cortelyou, of New York	Feb.	16, 1903
Victor H. Metcalf, of California	July	1, 1904

UNITED STATES MINISTERS TO GREAT BRITAIN.

T. Pinckney, S. C.	Minister Plenipotentiary	Jan.	12, 1792
John Jay, N. Y.	Envoy Extraordinary	Apr.	19, 1794
Rufus King, N. Y.	Minister Plenipotentiary	May	20, 1796
James Monroe, Va. / Wm. Pinkney, Md.	Ministers / Plenipotentiary	May / July	12, 1806 / 27, 1811
Jona. Russell, R. I.	Chargé d'affaires		
Albert Gallatin, Pa. / J. Q. Adams, Mass. / J. A. Bayard, Del.	Envoys Extraordinary and Ministers Plenipotentiary	April	17, 1813
J. Q. Adams, Mass. / J. A. Bayard, Del. / Henry Clay, Ky. / Jona. Russell, R. I. / Albert Gallatin, Pa.	Ministers Plenipotentiary and Extraordinary	Jan. / Jan. / Jan. / Jan. / Feb.	18, 1814 / 18, 1814 / 18, 1814 / 18, 1814 / 9, 1814
J. Q. Adams, Mass.	Envoy Extraordinary and Minister Plenipotentiary	Feb.	28, 1815
Richard Rush, Pa.	do	Oct.	—, 1817
Rufus King, N. Y.	do	May	5, 1825
Albert Gallatin, Pa.	do	May	10, 1826
James Barbour, Va.	do	May	23, 1828
Louis McLane, Del.	do	April	18, 1829
M. Van Buren, N.Y.	do	Aug.	1, 1831
Aaron Vail, N. Y.	Chargé d'affaires	July	13, 1832
A. Stevenson, Va.	Envoy Extraordinary and Minister Plenipotentiary	Mar.	16, 1836
Edw. Everett, Mass.	do	Sept.	13, 1841
Louis McLane, Md.	do	June	16, 1845
Geo. Bancroft, N.Y.	do	Sept.	9, 1846
A. Lawrence, Mass.	do	Aug.	20, 1849
J. R. Ingersoll, Pa.	do	Aug.	21, 1852
Jas. Buchanan, Pa.	do	Apr.	11, 1853
Jno. Appleton, Me.	Chargé d'affaires *ad interim*	Oct.	27, 1855
Geo. M. Dallas, Pa.	Envoy Extraordinary and Minister Plenipotentiary	Feb.	4, 1856
C. F. Adams, Mass.	do	Mar.	20, 1861
R. Johnson, Md.	do	June	12, 1868
J. L. Motley, Mass.	do	Apr.	13, 1869
R. C. Schenck, Ohio	do	Dec.	22, 1870
E. Pierrepont, N.Y.	do	May	22, 1876
John Welsh, Pa.	do	Nov.	9, 1877
J. R. Lowell, Mass.	do	Jan.	26, 1880
Edw. J. Phelps, Vt.	do	Mar.	23, 1885
R. T. Lincoln, Ill.	do	Mar.	30, 1889
T. F. Bayard, Del.	Ambassador Extraordinary and Plenipotentiary	Mar.	30, 1893
John Hay, D. of C.	do	Mar.	19, 1897
J. H. Choate, N. Y.	do	Jan.	19, 1899
Whitelaw Reid, N. Y.	do	Mar.	6, 1905

UNITED STATES MINISTERS TO GERMANY.

J. Q. Adams, Mass.	Minister Plenipotentiary	June	1, 1797
H. Wheaton, N. Y.	Chargé d'affaires	Mar.	3, 1835
H. Wheaton, N. Y.	Envoys Extraordinary and Minsters Plenipotentiary	Mar.	7, 1837
A. J. Donaldson, Tenn.	do	Mar.	18, 1846
E. A. Hannegan, Ind.	do	Mar.	22, 1849
D. D. Barnard, N. Y.	do	Sept.	3, 1850
P. D. Vroom, N. J.	do	May	24, 1853
J. A. Wright, Ind.	do	June	1, 1857
N. B. Judd, Ill.	do	Mar.	8, 1861
J. A. Wright, Ind.	do	June	30, 1865
G. Bancroft, N. Y.	do	May	14, 1867
G. Bancroft, N. Y.	do	May	31, 1871
J. C. B. Davis, N. Y.	do	June	11, 1874
Bayard Taylor, Pa.	do	Mar.	4, 1878
A. D. White, N. Y.	do	April	2, 1879
A. A. Sargent, Cal.	do	Mar.	2, 1882
Jno. A. Kasson, Ia.	do	July	4, 1884
G. H. Pendleton, O.	do	Mar.	23, 1885
W. W. Phelps, N.J.	do	June	20, 1889
Theo. Runyon, N. J.	do	Mar.	23, 1893
Theo. Runyon, N. J.	do	Sept.	14, 1893
Edw. F. Uhl, Mich.	Ambassador Extraordinary and Plenipotentiary	Feb.	10, 1896
A. D. White, N. Y.	do	April	5, 1897
Charl. Tower, Pa.	do	Sept.	26, 1902

UNITED STATES MINISTERS TO FRANCE.

T. Jefferson, Va.	Minister Plenipotentiary	Oct.	12, 1787
Wm. Short, Va.	Elected Chargé d'affaires	April	20, 1790
G. Morris, N. Y.	Minister Plenipotentiary	Jan.	12, 1792
James Monroe, Va.	do	May	28, 1794
C. C. Pinckney, S.C.	do	Sept.	9, 1796
C. C. Pinckney, S.C. / John Marshall, Va. / Elb. Gerry, Mass.	Joint Envoys Extraordinary and Ministers Plenipotentiary	July	22, 1797
O. Ellsworth, Conn. / W. Vans Murray, Md. / W. R. Davie, N. C.	Joint Envoys Extraordinary and Ministers Plenipotentiary	Feb. / Feb. / June	26, 1799 / 26, 1799 / 1, 1799
R. R. Livingston, N. Y.	Minister Plenipotentiary	Oct.	2, 1801
James Monroe, Va. / R. R. Livingston, N. Y.	Envoys Extraordinary and Ministers Plenipotentiary	Jan.	12, 1803
J. Armstrong, N. Y.	Minister Plenipotentiary	June	30, 1804
Jona. Russell, R. I.	Chargé d'affaires	Nov.	—, 1810
Joel Barlow, Conn.	Minister Plenipotentiary	Feb.	27, 1811
W. H. Crawford, Ga.	do	April	9, 1813
Albert Gallatin, Pa. / James Brown, Ia. / Wm. C. Rives, Va.	Envoys Extraordinary and Ministers Plenipotentiary	Feb. / Dec. / April	28, 1815 / 9, 1823 / 18, 1829
Levett Harris, Pa.	Chargé d'affaires	Mar	6, 1833
Ed. Livingston, La.	Envoy Extraordinary and Minister Plenipotentiary	May	29, 1833
Lewis Cass, Ohio	do	Oct.	4, 1836
Wm. R. King, Ala.	do	April	9 1844
Richard Rush, Pa.	do	Mar.	3, 1847
Wm. C. Rives, Va.	do	July	20, 1849
Jno. Y. Mason, Va.	do	Oct.	10, 1853
C. J. Faulkner, Va.	do	Jan.	16, 1860
W. L. Dayton, N. J.	do	Mar.	18, 1861
Jno. Bigelow, N. Y.	do	Mar.	15, 1865
Jno. A. Dix, N. Y.	do	Sept.	24, 1866
E. B. Washburne, Ill.	do	Mar.	17, 1869
Edw. F. Noyes, O.	do	July	1, 1877
L. P. Morton, N.Y.	do	Mar.	21, 1881
R. M. McLane, Md.	do	Mar.	23, 1885
White. Reid, N. Y.	do	Mar.	23, 1889
T. J. Coolidge, Mass.	do	May	12, 1892
Jas. B. Eustis, La.	Ambassador Extraordinary and Plenipotentiary	Mar.	20, 1893
Jas. B. Eustis, La.	Ambassador Extraordinary and Plenipotentiary	April	8, 1893
H. Porter, N. Y.	do	Mar.	19, 1897
R. S. McCormick, Ill.	do	Mar.	6, 1905

UNITED STATES MINISTERS TO RUSSIA.

		Commissioned
J. Q. Adams, Mass.	Minister Plenipotentiary	June 27, 1809
Levett Harris, Pa.	Chargé d'affaires	April 7, 1814
Albert Gallatin, Pa.	Envoys Extraordinary and Ministers Plenipotentiary	April 22, 1813
J. A. Bayard, Del.		
J. Q. Adams, Mass.		
Wm. Pinkney, Md.	Envoy Extraordinary and Minister Plenipotentiary	Mar. 7, 1816
G. W. Campbell, Tenn.	do	April 16, 1818
H. Middleton, S. C.	do	April 6, 1820
John Randolph, Va.	do	May 26, 1830
Jas. Buchanan, Pa.	do	Jan. 4, 1832
Wm. Wilkins, Pa.	do	June 30, 1834
J. R. Clay, Pa.	Chargé d'affaires	June 29, 1836
Geo. M. Dallas, Pa.	Envoy Extraordinary and Minister Plenipotentiary	Mar. 7, 1837
C. C. Cambreleng, N. Y.	do	May 20, 1840
Chas. S. Todd, Ky.	do	Aug. 27, 1841
R. J. Ingersoll, Conn.	do	Aug. 8, 1846
A. P. Bagby, Ala.	do	June 15, 1848
N. S. Brown, Tenn.	do	May 2, 1850
T. H. Seymour, Conn.	do	May 24, 1853
F. W. Pickens, S.C.	do	Jan. 11, 1858
John Appleton, Me.	do	June 8, 1860
C. M. Clay, Ky.	do	Mar. 28, 1861
Simon Cameron, Pa.	do	Jan. 17, 1862
C. M. Clay, Ky.	do	Mar. 11, 1863
A. G. Curtin, Pa.	do	April 16, 1869
Jas. L. Orr, S. C.	do	Dec. 12, 1872
M. Jewell, Conn.	do	May 29, 1873
Geo. H. Boker, Pa.	do	Jan. 13, 1875
E. W. Stoughton, N. Y.	do	Oct. 30, 1877
J. W. Foster, Ind.	do	Jan. 26, 1880
Wm. H. Hunt, La.	do	April 12, 1882
Alph. Taft, Ohio.	do	July 4, 1884
G. V. N. Lothrop, Mich.	do	May 7, 1885
Lambert Tree, Ill.	do	Sept. 25, 1888
Allen T. Rice, N. Y.	do	Mar. 30, 1889
Chas. E. Smith, Pa.	do	Feb. 14, 1890
A. D. White, N. Y.	do	July 22, 1892
C. R. Breckinridge, Ark.	do	July 20, 1894
E. A. Hitchcock, Mo.	Ambassador Extraordinary and Plenipotentiary	Aug. 16, 1897
Charl. Tower, Pa.	do	Feb. 11, 1898
R. S. McCormick, Ill.	do	Jan. 12, 1899
Geo. v. L. Meyer, Mass.	do	Sept. 26, 1902
	do	Mar. 6, 1905

See also UNITED STATES — PRESIDENTS AND VICE-PRESIDENTS OF.

ROBERT BRENT MOSHER,
Chief of the Bureau of Appointments, Department of State.

62. United States — The Great Seal of the. On 4 July 1776, when the Declaration of Independence had been finally acted upon, John Hancock, president of the Continental Congress, arose and said, "We now are a nation, and I appoint Benjamin Franklin, John Adams and Thomas Jefferson a committee to prepare a device for a Great Seal of the United States of America." The committee immediately proceeded to perform its assigned duty and after six weeks of labor, during which time many designs were submitted and considered, it was agreed that the conjoint design of Jefferson be reported to Congress on 10 Aug. 1776. His device for a Great Seal was very elaborate, containing on a shield something emblematic of the several nations from which America was peopled. Jefferson's report read as follows: "The committee to whom was referred on the Fourth day of July last, the duty of preparing a device for a Great Seal of the United States of America, in Congress assembled, beg leave to report the following description:

"The Great Seal should on one side have the arms of the United States of America, which arms should be as follows: The shield has six quarters, parti, one, coupé, two. The first or, an enamelled rose, gules, and argent, for England; the second argent, a thistle proper, for Scotland; the third vert, a harp, for Ireland; the fourth azure, a fleur-de-lis, for France; the fifth or, the imperial eagle, sable, for Germany; and the sixth or, the Belgic crowned lion gules, for Holland; pointing out the countries from which the States have been peopled. The shield within a border gules, entwined of 13 escutcheons, argent, linked together by a chain or, each charged with initial sable letters, as follows: (1) N. H., (New Hampshire); (2) Mass., (Massachusetts); (3) R. I., (Rhode Island); (4) Conn., (Connecticut); (5) N. Y., (New York); (6) N. J., (New Jersey); (7) Penn., (Pennsylvania); (8) Del., (Delaware); (9) Md., (Maryland); (10) Va., (Virginia); (11) N. C., (North Carolina); (12) S. C., (South Carolina); (13) Ga., (Georgia); for each of the 13 independent States of America.

"Supporters, dexter, the Goddess of Liberty, in a corslet of armor, in allusion to the then state of war, and holding in her right hand the spear and cap, and with her left supporting the shield of the States; sinister, the Goddess of Justice, bearing a sword in her right hand, and in her left a balance.

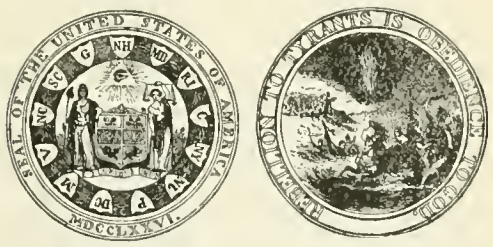
"Crest, the eye of Providence in a radiant triangle, whose glory extends over the shield and beyond the figures; motto, 'E Pluribus Unum.'

"Legend round the whole achievement, 'Seal of the United States of America, MDCCLXXVI.'

"On the other side of the said Great Seal should be the following device:

"Pharaoh sitting in an open chariot, a crown on his head, and a sword in his right hand, passing through the divided waters of the Red Sea, in pursuit of the Israelites. Rays from a pillar of fire in the cloud, expressive of the divine presence and command, beaming on Moses, who stands on the shore, and extending his hand over the sea, causes it to overthrow Pharaoh.

"Motto, 'Rebellion to Tyrants is Obedience to God.'"



Conjoint Devices — Reported by Jefferson.

Without any additional remarks, after having finished reading, Jefferson quietly took his seat. Congress referred the report back to the committee, asking for an early supplemental report. It may be interesting to learn how Jefferson came to make the report and also learn what Franklin and Adams contributed to the committee's report. A Frenchman, Du Simetière by name, had been requested to attend the committee meeting, he being the most expert pen-and-pencil artist in Philadelphia. He took great interest in the American cause; and his attention was early called to the fact that in America, artists were in demand; and, in consequence he began painting profiles in black, of distinguished Americans and caricatures of prominent Englishmen engaged in the war. His paintings and miniatures had attracted general attention, which led the committee to engage him to sketch devices for a Seal. Du Simetière proposed a Norman shield divided into six quarterings.

First Quartering symbolized the English inhabitants of this country and placed first upon the shield to indicate that they were a primary factor in the new confederacy. English civilization was planted among the forests of America as early as 1607, in the colony of Virginia.

Second Quartering was intended for Scotland, a thistle in its proper color or an argent field, representing Scotch people as included in our national fold.

Third Quartering, green, with a harp of gold, was to be the respected symbol of Ireland, and was placed upon the shield as a token to the Irish patriots who took an active part in the war for independence.

Fourth Quartering was supposed to do honor to the French people.

Fifth Quartering, in honor of the German settlers was a golden field and upon it the imperial black eagle.

The Sixth Quartering represented the Dutch and a lion in gules was the emblem.

The dexter supporter of the shield was the Goddess of Liberty, with a Phrygian cap on a staff. The sinister supporter was to typify a continental soldier in uniform, holding in right hand a hatchet, in the left a gun. As a motto or "war cry" the Latin words, "*Bello vel Pace.*" Above the shield an eye of Providence. The border contained the words: "The Great Seal of the United States of America."

Franklin proposed for a Seal, Moses lifting his wand and dividing the Red Sea, and Pharaoh and his chariot overwhelmed with the

Du Simetière's Design of Seal.

Franklin's Suggestion.

waters. For a motto well befitting the existing circumstances and one that would be a cherished "war cry" for future generations he suggested: "Rebellion to Tyrants is Obedience to God." Franklin's aim was to depict that Providence favored slaves and bondsmen, and destroyed tyrants and usurpers; and for his illustration he chose the war between the Israelites and Egyptians. In modern times the legend on his design began to be used about 1645, and was then used as a "war cry" by Cromwell's party; it was intended to refer to Charles I. The reinvention has been attributed by some, to Oliver Cromwell, but later research would indicate that John Bradshaw, president of the court of judges who tried Charles I., is the person who gave voice to this expressive motto. Thomas Jefferson later adopted this motto as his sentiment on his personal seal. But Jefferson suggested to the committee that the Seal contain an obverse and a reverse side: on the former the Children of Israel, led by a "cloud" by day and a "pillar of fire" by night; on the latter Hengist and Horsa the "Saxon Chiefs, from whom we claim the honor of being descended, and whose political principles and form of government we are now about to assume."

John Adams' proposal was of a different character; he recommended — so the report tells, "The choice of Hercules, as engraved by Gribelin in this edition of Lord Shafteshury. You notice the hero resting on a club; Virtue pointing to her rugged mountain on one hand, and persuading to ascend; and Vice glancing at her flowery paths of pleasure, wantonly reclining on the ground, displaying the charms both of her eloquence and person, to seduce him into vice." Hercules, as the central figure, was to symbolize the young nation; indicating strength, valor, perseverance, and immortality. The Goddess of Pleasure, on the sinister side, was to depict all forms of corruption, and would thoroughly represent a lack of dignity and respect, or the seven vices — pride, wrath, envy, lust, gluttony, avarice and sloth. The Goddess of Virtue, on the dexter side, was to be the guide of the young government and as such would enforce her "seven cardinal excellences," namely, Faith; Hope; Charity; Prudence; Justice; Fortitude, and Temperance.

These few designs were then carefully considered by the committee and finally Franklin suggested that the draughts be placed in Jefferson's hand and that he select the meritorious features in all and combine them into a conjoint device. This is how it came about that Jefferson reported to Congress the composite device for a Great Seal. In this conjoint design by Jefferson, we see several new ideas — namely, a goddess of Justice, and the 13 shields in the border, representing the colonies, bound together by 13 links of a chain. He also added the motto, "E Pluribus Unum," and his drawing dated the Seal MDCCLXXVI.

In the spring of 1779, Congress was overjoyed at the evacuation of Philadelphia and anon returned to the patriotic city to continue its important work, and again the Continental Congress began to arrange for a Committee on Great Seal. On the afternoon of Wednesday 24 March 1779, James Lovell of Massachusetts addressed the Continental Congress on the "Grand Future of the United States," referring in the course of his speech to the grand triumph of Gates over the British at Saratoga. John Jay was the presiding officer, and he appointed Mr. Lovell of Massachusetts, with Scott of Virginia, and Houston of Georgia, as a committee, requesting that they report within a fortnight. The committee immediately set to work, but the bulk of the labor fell to the hands of Chairman

Adams' Design.

Lovell, who applied for artistic assistance to Du Simetière, who had done justice to the devices suggested by the former committee. After a lapse of some 10 days Lovell showed his device to his coadjutors, who highly approved of the same, and on the 10 May following the committee reported that —

The Seal shall be four inches in diameter; on one side the arms of the United States as follows:

The Shield charged in the field with thirteen diagonal strips, alternately red and white.

Supporters: Dexter, warrior holding a sword; sinister, a figure representing Peace, bearing an olive branch.

The Crest, a radiant constellation of thirteen stars.

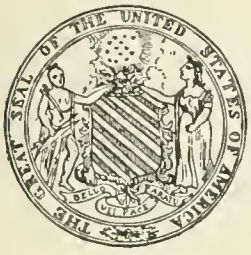
The Motto: "Bello vel Pace."

The Legend round the achievement, "Seal of the United States."

On the Reverse: The Figure of Liberty, seated on a chair, holding the staff and cap.

Motto: "Semper"; underneath, "MDCCLXXVI."

The report made a favorable impression on the members. On account of important matters demanding immediate attention, further consideration of the Seal was postponed until 17 May, when after a lengthy and heated discus-



Lovell's Design (Obverse). Lovell's Design (Reverse).

sion, the report was ordered to be recommitted. The committee to whom was recommitted the re-devising of the proposed Seal, made their report on Wednesday, 17 May 1780, just one year to the day, when they gave their first report. The chairman, Mr. Lovell, rose in Congress and read:

The Committee, to whom was referred, on the 17th of March last (1779), the report of a former Committee on the devices of a Great Seal of the United States in Congress assembled, beg leave to report the following description:

The Seal to be three inches in diameter, on one side the Arms of the United States as follows: The Shield charged in field azure, with thirteen diagonal stripes, alternate rouge and argent.

Supporters: Dexter, a Warrior holding in hand a bow and arrow. Sinister, a figure representing Peace, bearing the olive branch.

The Motto: "Bello vel Pace Paratus."

The Legend around the achievement: "The Great Seal of the United States."

On the Reverse: The figure of Liberty seated on a chair holding a staff and cap.

The Motto: "Virtute Perennis." Underneath, MDCCLXXX.

Much to the surprise of the committee, and especially Mr. Lovell, the Continental Congress was hard to please, and contrary to what they had expected, their report was rejected; and once more the matter of a Seal rested till months and even years rolled by. Early in April 1782, John Hanson, then president of the Confederation Congress, briefly addressed that body on the necessity of a National Seal, and appointed Henry Middleton, Elias Boudinot, and Edward Rutledge as a committee to prepare a suitable device. The committee, after a diligent search for something appropriate, finally agreed that they report substantially as the committee of 1780, and so on 9 May 1782, Chairman Middleton submitted the former designs. In consequence of Congressional dissatisfaction the entire previously submitted devices were, on 13 June 1782 referred to Charles Thomson, secretary of the Confederation Congress. On 13 June 1782, immediately after his appointment, he, in the company of Dr. Arthur Lee and Elias Boudinot, set out soliciting designs for the Seal. They had called on several prominent men of Philadelphia, requesting, they should devise designs, and among those called upon was one, a young and talented graduate, Will Barton, A.M., brother of the patriotic Dr. Benjamin Barton. Young Barton unhesitatingly told Thomson, that he would diligently comply with the request, and the three missionaries left, feeling sure that an appropriate device would ripen ere the next morn. Barton at once began rummaging through his few books on heraldry, and after remaining up nearly all that night, retired believing that the question of an ideal Seal was solved. Some few days after Barton submitted the following:

Arms.—Paleways of thirteen pieces, argent and gules; a chief azure; the escutcheon placed on the breast of an American eagle (the bald-headed), displayed proper; holding in his beak a scroll, inscribed with the motto, viz.:

"E Pluribus Unum,"

and in his dexter talon, a palm or an olive branch; in the other a bundle of thirteen arrows; all proper.

For the Crest.— Over the head of the eagle, which appears above the escutcheon, a glory, or breaking through a cloud, proper, and surrounding thirteen stars, forming a constellation, argent on an azure field.

In the exergue of the Great Seal,

Jul IV., MDCCLXXVI."

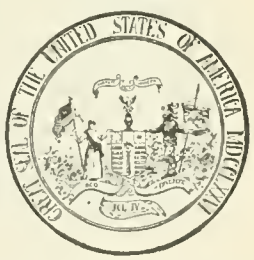
In the margin of the same,

"Sigil. Mag. Reipub. Confœd. Americ."

Remarks.—The escutcheon is composed of the chief and pale, the two most honorable ordinaries; the latter represents the several States, all joined in one solid compact entire, supporting a chief, which unites the whole and represents Congress. The motto alludes to the Union. The colors or tinctures of the pales are those used in the flag of the United States. White signifies purity, innocence; red, hardiness and valor. The chief denotes Congress. Blue is the ground of the American uniform, and this color signifies vigilance, perseverance, and justice.

The meaning of the crest is obvious, as is likewise that of the olive branch and arrows.

Mr. Thomson was highly pleased with Barton's device, but intimated that the design if anything was too plain, whereupon Barton of-



Barton's First Design. Barton's Second Design.

fered to complete another. On 15 June Barton again called at Thomson's residence where he found the secretary, Dr. Arthur Lee and Elias Boudinot awaiting his arrival. After a few moments of verbal exchange he handed them a large drawing with the following description:

A device for an armorial achievement for the Great Seal of the United States of America, in Congress assembled, agreeable to the rules of Heraldry, proposed by William Barton, A.M.

Arms.—Barry of thirteen pieces, argent and gules, on a canton azure, and many stars disposed in a circle of the first; a pale or, surmounted of another, of the third, charged in chief, with an eye surrounded with a glory proper; and in the fess-point an eagle displayed on the summit of a Doric column, which rests on the base of the escutcheon, both as the stars.

Crest.—Or an helmet of burnished gold damasked, grated with six bars, and surmounted with a cap of dignity, gules, turned up ermine, a cock armed with gaffs proper.

Supporters.—In the dexter side: the genius of America (represented by a maiden with loose auburn tresses),

having on her head a radiated crown of gold encircled with a sky blue fillet, spangled with silver stars, and clothed in a long loose white garment bordered with green. From her right shoulder to her left side a scarf, semee of stars, the tinctures thereof the same as in the canton; and round her waist a purple girdle, fringed or embroidered, argent, with the word "Virtue," resting her interior hand on the escutcheon, and holding in the other the proper standard of the United States, having a dove argent perched on the top of it.

On the sinister side; a man in complete armor, his sword-belt azure fringed with gold, his helmet encircled with six bars, and surmounted by a red cap of dignity, two blue plumes; supporting with his dexter hand the escutcheon, and holding in the interior a lance, with the point sanguinated, and upon it a banner displayed, vert; in the fess-point a harp strung with silver, between a star in chief, two fleurs-de-lis in fess, a pair of swords in saltier, in basses, all argent. The tenants of the escutcheon stand on a scroll, on which is the following motto:

"Deo Favente,"

which alludes to the eye in the arms, meant for the eye of Providence.

Over the crest, in a scroll, this motto:

"Virtus Sola Invicta."

After thoroughly discussing the matter they agreed, that Barton had done exceedingly well, but they believed the device entirely too elaborate and complex; and also that he had failed

Barton's Third Design (Obverse).

Barton's Fourth Design (Reverse of third design).

to present them with a design of the reverse side of his proposed seal. Mr. Barton, however, satisfied them that he would abridge the obverse, and furnish a reverse by the next meeting, which they agreed should be the following night. As per appointment he called 16 June and presented his new sketches, the description of which is as follows:

OBVERSE SIDE.

Arms: An escutcheon consisting of a blue border, spangled with thirteen white stars, and divided in the centre, perpendicularly by a gold bar; on each side of this division, within the blue border; thirteen bars or stripes, alternately white and red, like the American flag, adopted 14 June 1777. Within the Doric column a gold bar bearing a displayed eagle on its summit.

Crest: A helmet of burnished gold, and engrated with six bars, and surmounted by a red cap of dignity such as dukes wear, with an ermine lining; supporting a displayed cock armed with gaffs, in the sinister talon he held the new ensign of the Confederacy, the stars and stripes—and in the dexter talon a sword, on the point of which was suspended a wreath of laurels. Above the crest this motto:

"In Vindiciam Libertatis."

Supporters: On the dexter side, the genius of America (represented by a maiden with loose, auburn tresses), having on her head a radiated crown of gold, encircled with a sky-blue fillet, and clothed in a long loose white garment, bordered with green. From her right shoulder to her left side a scarf, semee of stars, the tinctures thereof the same as in the shield-border, and around her waist a blue girdle, fringed or embroidered with silver; her sinister hand rested on and supported the shield, and upon her dexter hand was perched a dove argent.

The sinister supporter was an ideal or typical American soldier dressed in a uniform peculiar to an American, with a naked sword in the hilt, on his head a felt hat, distinguishing him as an officer, with his dexter hand resting on the escutcheon, and in his sinister a wrapped roll of paper (evidently the Declaration of Independence). The tenants of the escutcheon stand on a scroll on which is the following motto: "Virtus Sola Invicta."

The entire is designated as "Great Seal of the American Confederacy." He proposed as the reverse, the following:

An unfinished pyramid, consisting of ten layers of stone. [He undoubtedly intended that there should be thirteen.] In the zenith, the eye of Providence, surrounded with a glory. Over or about the eye the Latin phrase "Deo Favente"—with God's favor. At the base of the pyramid the word "Perennis"; the former motto is the same as on his second design and the latter is taken from the device of the second committee on the Seal.

Secretary Thomson decided he would report the first design of Mr. Barton as the obverse and his fourth design as the reverse, as follows:

The Secretary of the United States, in Congress assembled, to whom were referred the several reports of committees on the device of a Great Seal to take order reports:

That the device for an armorial achievement and reverse of a Great Seal for the United States in Congress assembled, is as follows:

Arms: Paleways of thirteen pieces, argent and gules, a chief azure. The escutcheon on the breast of the American bald eagle, displayed proper, holding in his dexter talon an olive branch and in his sinister, a bundle of thirteen arrows, all proper, and in his beak a scroll, inscribed with this motto:

"E Pluribus Unum."

For the Crest: Over the head of the eagle, which appears above the escutcheon, a glory, or breaking through a cloud proper, and surrounding thirteen stars, forming a constellation, argent on an azure field.

Reverse: A pyramid unfinished. In the zenith an eye in a triangle, surrounded with a glory proper. Over the eye these words:

"Annuit Coeptis."

On the base of the pyramid the numerical letters MDCCLXXVI., and underneath the following motto:

"Novus Ordo Seclorum."

Thomson's report was adopted on 20 June 1782, and Congress instructed him to have the design executed in metal. Accompanying the sketch was the following definition of the Seal; this is the authentic meaning of our emblem:

Adopted Seal (Reverse).

Adopted Seal (Obverse).

Remarks and Explanations: The escutcheon is composed of the chief and pale, the two most honorable ordinaries. The pieces paly, represent the several states all joined in one solid compact entire, supporting a chief which unites the whole and represents Congress. The motto alludes to this Union. The pales in the Arms are kept closely united by the chief, and the chief depends upon that union, and the strength resulting from it for its support to denote the Confederacy of the United States of America, and the preservation of the Union through Congress.

The colors of the pale are those used in the flag of the United States of America; white signifies purity and innocence; red, hardiness and valor; and blue, the color of the chief, signifies vigilance, perseverance, and justice. The olive-branch and arrows denote the power of Peace and War, which is exclusively vested in Congress. The constellation denotes a new State taking its place and rank among sovereign powers. The escutcheon is borne on the breast of the American eagle, without any other support, to denote that the United States of America ought to rely on their own virtues.

Reverse: The pyramid signifies strength and duration. The eye over it and the motto, allude to the many and signal interpositions of Providence in favor of the American cause. The date underneath is that of the Declaration of Independence; and the words under it signify the beginning of the new American era which commences from that date.

It has been claimed of late years, that we owe the design for our nation's mark, to Sir John Prestwick of England. That this statement has been made through carelessness and lack of thorough research on the part of our historical writers, can easily be proven; and inasmuch as we have definite authority to establish this proof let us as Americans closely stand by our American patriot, Will Barton, and give him this honor due and preserve his name among the other great benefactors of the Union. The following letter Secretary Thomson wrote Will Barton a few days after the adoption of the Great Seal, and in it there is all the evidence possible to refute the claims of the Royalists. It is as follows:

Philadelphia, Penn.

MR. WILL BARTON, *Sir:*

I am much obliged for the perusal of the 'Elements of Heraldry' which I now return. I have just dipped into it so far as to be satisfied that it may afford a fund of entertainment, and may be applied by a State to useful purposes. I am much obliged for your very valuable present of 'Fortescue de Laudibus Legum Angliæ,' and shall be happy to have it in my power to make a suitable return.

I enclose you a copy of the device by which you have displayed your skill in beraldic science, and which meets with general approbation.

I am, sir, Your obedient, humble servant,
(Signed) CHARLES THOMSON.
June 24, 1782.

In reference to the above letter Mr. Barton in after years wrote the following note, which goes to corroborate the statement, that he designed the present Great Seal of the United States:

Lancaster, Penn.

In June 1782, when Congress was about to form an armorial device for a Great Seal for the United States, Charles Thomson, Esq., then secretary, with the Hon. Arthur Lee and Elias Boudinot, members of Congress, called on me and consulted me on the occasion. The Great Seal, for which I furnished those gentlemen with devices (as certified by Charles Thomson, Esq.), was adopted by Congress on the 20th of June 1782. Mr. Thomson informed me four days after the design met with general approbation.

(Signed) W. BARTON.

Charles Thomson had the obverse side of the seal cut in brass — the reverse side was never cut or used. Strictly speaking the national documents are not sealed as the enactment calls. The first time the Great Seal was used it was found on a commission dated 16 Sept. 1782, granting full power and authority to Gen. George Washington for arranging with the British for exchange of prisoners of war. This commission is signed by John Hanson, president of the Confederation Congress, and countersigned by Charles Thomson, secretary of the same body; the seal on this document being impressed upon the parchment, over a white wafer, fastened by red wax in the upper left hand corner, instead of the lower left hand corner as is now the custom. This document is in the possession of the State Department and few papers are more carefully stored or more highly cherished. The seals of many of our States contain emblems borrowed from the "Great Seal." This is also true of many of the seals of government departments. The historic and much admired china set of the White House has the Great Seal blazoned upon every piece — the seal being in heraldic tinctures. The Great Seal of the United States being used very frequently, its wear of necessity is great, and several secretaries of state had it retouched and corrected. Officially the Great Seal has been changed in Webster's term, in Frelinghuysen's term, and in John Hay's term.

In 1841, during the administration of President Tyler, it was found by Webster, then secretary of state, that the Seal was badly worn and beyond the engraver's power of redemption. The President then ordered that Webster see that a new Seal be engraved. The engraver, it seems, found it difficult to engrave the bundle of 13 arrows, and with Webster's advice and consent agreed that six arrows would suffice.

Second Great Seal — 1841 (Webster's).

Present Great Seal.

In 1885, during the administration of Chester A. Arthur, Mr. Frelinghuysen, the secretary of state, found that the Great Seal was badly worn and beyond restoration. The secretary consulted Mr. Arthur, who ordered that a new Seal be executed. This Seal also lacks the true heraldic significants. In 1903 Secretary John Hay's attention was called to the lapses in the execution of the Seal and President Roosevelt ordered that a new one be made. The present Seal is a beautiful emblem and is considered the most artistic "hand mark" of the nations. See SEAL.

B. J. CIGRAND,
Author of 'History of American Emblems.'

United States Army. See ARMY OF THE UNITED STATES.

United States Architecture. See ARCHITECTURE, AMERICAN.

United States Christian Commission, a unique and almost unparalleled association in its origin and operation, which came into existence during the Civil War, for the purpose of promoting the spiritual welfare of the Federal soldiers, sailors, marines, etc., while alleviating, comforting, and humanizing their temporal needs. It originated at a convention of the Young Men's Christian Associations of the Northern States, called for the purpose 16 Nov. 1861, in the city of New York, and while the war lasted was in full operation. Its activities became familiar to nearly everyone throughout the entire community and the civilized world, and it received liberal and generous support in voluntary services, money, supplies, and literature. The appointed members of the commission were George H. Stuart, Philadelphia; Rev. Rollin H. Neale, D.D., Boston; John P. Crozer, Philadelphia; Bishop E. S. Janes, New York; Rev. M. L. R. P. Thompson, D.D., Cincinnati; Hon. B. F. Manierre, New York; Col. Clinton B. Fiske, Saint Louis; Rev. Benjamin C. Cutler, D.D., Brooklyn; John V. Farwell, Chicago; Mitchell H. Miller, Washington; and John D. Hill, M.D., Buffalo. The commission met at Washington, D. C., and organized by appointing George H. Stuart as chairman; Hon. B. F. Maniere, treasurer; Rev. A. M. Morrison, secretary; while the executive committee was composed of George H. Stuart, Bishop Janes, Dr. Cutler, Charles Demond, and the Hon. B. F. Manierre. The commission was located at first in New York. During the first year changes in the commission were filled by Jay Cooke, Philadelphia, and Rev. James Eels, D.D., Brooklyn. The Rev. W. E. Boardman replaced the Rev. A. M. Morrison as secretary; Joseph Patterson the Hon. B. F. Manierre as treasurer; and for convenience the commission removed to Philadelphia. While the central office of the commission was in Philadelphia, important auxiliary branches were organized in all the large cities and towns, whose officials and members were especially active in promoting this great mission of mercy.

As the operations of the committee involved large expenditures, it was necessary to make proper provision to meet them. From the commencement the finances were carefully managed. The committee resolved to incur no responsibilities which could not be promptly met, and to this rule they steadily adhered. The policy inspired public confidence, and contributed not a little to the prosperity and efficiency of the commission. The usual mode of awakening and continuing an interest in its behalf was by spreading information before the people through the religious and secular press, by public meetings, by special appeals and by enlisting the clergy to bring the subject before their congregations. This latter method was productive of large results. Lotteries, raffles, and other doubtful means of raising funds, then much in vogue, sensational or clap-trap appeals, were studiously avoided. To select, commission, and send forth persons to act as delegates was a most important and delicate duty. These persons represented, on the one hand, the commission and the Christian and patriotic sentiment of the people; and on the other, had to accommodate themselves to the rules of the military and naval service, commend themselves and their work to the officers in charge, and minister acceptably to the physical, mental, and religious wants of the men. To the appeal of the commission for helpers there was a whole-hearted response, and the difficulty arose to make a proper selection from among those who offered their services; 4,859 delegates were commissioned during the war. From its origin to its close the commission had the warm approval of the general government, and received every possible facility for carrying out its operations; transportation and telegraph companies assisted, and the American Bible and Tract Societies donated for distribution thousands of their publications. The cash receipts of the commission during the four years of the war amounted to $2,524,512; the value of the stores donated was $2,839,445; the value of the publications donated was $300,000. Chapels for religious worship and temporary libraries were established in the camps; 136,152 sermons were preached and prayer meetings held, and, among other work, the delegates wrote 92,321 letters and gave the dead Christian burial, also suitably marking the graves of the known dead. Consult: 'United States Christian Commission — Facts, Principles, and Progress' (1863); 'Memorial Record of the New York Branch of the United States Christian Commission' (1866).

United States Daughters of 1812, National Society of. This society is an organization founded for the purpose of memorializing historical events from the close of the war of the American Revolution to the formation of the United States (as such) and till the close of the second war with Great Britain in 1815, to collect all historical, genealogical and biographical data, to search for and bring to light any valuable documents pertaining to that period and to carefully classify and preserve the same. It is preparing a home where the descendants of the patriots of that time can be sheltered as old age, loss of friends and money leaves them uncared for. It takes up all patriotic work called forth by current circumstances such as that of the Spanish-American war, when it sent nurses and books and necessities to the army and cared for the families which were left in need at home. It has placed tablets in historical places — one in the Post Chapel at West Point in honor of the army of that period, one on Columbia College to mark the "Chain of Defenses" in 1818–1815, and is now preparing one for Lundy's Lane. The monument is being completed on the Field of Chalmette (Battle of New Orleans) and one put up in Detroit in honor of Gen. Alexander Macomb, and in Plattsburg, N. Y., in honor of the victory there. Efforts are being made to save the frigate Constitution, the sloop Polly (in commission from Maine in 1814), to raise Perry's flag-ship — the Niagara — and to hold in patriotic remembrance the Constellation, the oldest naval vessel now in existence. It sends remembrances to Hiram Kronk, the only survivor of that war, now 104 years of age, and commemorates the birth of the United States Navy (by the naval

memorial exercises of casting flowers upon the water in honor of those lost in action, and by furnishing rooms in the buildings built for the navy in Brooklyn and in California); honors the framing and adoption of the Constitution of the United States, and their formation, and rejoices that the 'Star Spangled Banner' was so loyally brought forth by Francis Scott Key under the influence of the action at Fort McHenry. The Western States are marking the spots of protection during that pitiless border warfare which succeeded the Revolution.

This present society is the outcome of the "General Society United States Daughters 1812," founded by Flora Adams Darling in 1892, on the anniversary of the Battle of New Orleans, 8 January. Its work begins where that of the revolutionary commemorative societies leaves off, namely, when the Treaty of Peace was ratified by the Congress in session on 14 Jan. 1784. The qualifications for membership are: Any woman over 18 years of age, of good character, and a lineal descendant of an ancestor who rendered civil, military, or naval service during the War of 1812, or the period of the causes which led to that war (subsequent to the War of the Revolution), 14 Jan. 1784 to 2 Nov. 1815, may be eligible to membership, provided, the applicant be acceptable to the society. Girls under 18 and over 10 years of age can join this society, and shall be called "Juniors." This comprises women whose lineal ancestors took part in the framing of the Constitution of the United States, members of any of the congresses during the administration of Presidents Washington, Adams, Jefferson, Madison, and the first two years of President Monroe, were in the Wyoming Disturbances in Pennsylvania, Shay's Rebellion in Massachusetts, Wars with the Miamies, Wyandotts, Delawares, Pottawatamies, Shawnees, Chippewas and Ottawas, during the Whiskey Rebellion in Pennsylvania, War with France, War with Tripoli, Burr Conspiracy, Sabine Expedition in Louisiana, the Naval affair on the Chesapeake, the Embargo Troubles on Lake Champlain, War with the Northwest Indians, Florida Seminole War, Peoria Indian War, Creek Indian War, the Louisiana Purchase Commissioners and the Second War with Great Britain up to the time when Commodore Decatur's treaty with the Algerians was ratified by the United States Congress on 2 Nov. 1815.

The name "United States Daughters" covers the period from 1784 to 1812. "Daughters of 1812" the period from 1812 to 1815, and the two names are connected without a repetition of the word "Daughters." The form of organization is as near that of the United States Government as is possible. The entire society is the people. The associate council of delegates is the Congress. The executive board is the cabinet, while each organized State is perfectly independent as is each of the United States.

The five years from 1892 to 1897 ended in the organization of the following States: New York, Mrs. William Gerry Slade, president; Louisiana, Mrs. John B. Richardson, president; Michigan, Mrs. Alfred Russell, president. In 1901 the society received a federal incorporation by act of the Congress of the United States, its charter being one of the last — if not the last — bill signed by President McKinley, on 25 February, is as follows, and contains its purposes:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Mrs. Flora Adams Darling, of New York; Mrs. William Gerry Slade, of New York; Mrs. Louis W. Hall, of Pennsylvania; Mrs. Edward Roby, of Illinois; Mrs. M. A. Ludin, of New York; Mrs. Le Roy Sunderland Smith, of New York; Miss Helen G. Bailey, of New Hampshire; Mrs. Alfred Russell, of Michigan; Mrs. William Lee, of Massachusetts; Mrs. William Tod Helmuth, of New York; Mrs. Nelson V. Titus, of Massachusetts, their associates and successors, are hereby created a body corporate and politic in the District of Columbia, by the name of the National Society of United States Daughters of Eighteen Hundred and Twelve, for patriotic, historical, educational and benevolent purposes, the objects of which are as follows: To perpetuate the memory and spirit of the men and women who were identified with the war of eighteen hundred and twelve by publication of memoirs of famous women of the United States during that period, and the investigation, preservation, and publication of authentic records of men in the military, naval and civil service of the United States during the said period; by making the society one of the factors of educational and patriotic progress, and by the promotion and erection of a house or home where the descendants of the zealous and brave patriots who achieved American independence who have need of such a home may be sheltered from the storms of life.

That the said society is authorized to hold real and personal estate in the United States, so far only as may be necessary to its lawful ends, to an amount not exceeding two hundred thousand dollars, and may adopt a constitution and make by-laws not inconsistent with law, and may adopt a seal.

At this time the following States had been added: 1897, Pennsylvania, Mrs. Louis W. Hall; 1897, Massachusetts, Mrs. Nelson V. Titus; 1900, Maine, Mrs. Charles A. Dyer; 1900, Ohio, Mrs. T. L. A. Greve; 1900, Maryland, Mrs. Robert C. Barry; 1901, Wisconsin, Mrs. Charles Catlin. Since then, and up to 1904, the additional organized States are: Vermont, 1901, president, Mrs. Clarence F. R. Jenne; Georgia, 1901, president, Miss Nina Hornady; Missouri, 1901, president, Mrs. Western Bascome; New Jersey, 1901, president, Miss M. Louise Edge; Colorado, 1902, president, Mrs. William T. Gauss; Delaware, 1902, president, Mrs. Millard F. Corkran; Illinois, 1903, president, Mrs. Robert Hall Wiles; Texas, 1903, president, Mrs. Z. T. Fulmore; District of Columbia, 1903, president, Mrs. Frank Wheaton; Mississippi, 1903, president, Mrs. William R. Wright.

Organizing presidents have been appointed in Alabama, Miss E. J. Hansell; Washington, Mrs. Esther Allen Jobes; Iowa, Miss Mary C. Key; New Hampshire, Miss Elizabeth Flather; Arkansas, Mrs. Charles Henry Wilmans; Kentucky, Mrs. George H. Wilson.

There have been but two national presidents, Mrs. Flora Adams Darling (till 1897) and Mrs. William Gerry Slade of New York city.

The national vice-presidents have been: Mrs. Stephen Adams, Webster, Ohio; Miss Georgina Campbell, Ohio; Mrs. Celestra Waldron, Ohio; Mrs. William Gerry Slade, New York; Mrs. Louis W. Hall, Pennsylvania; Mrs. George A. Ludin, New York; Mrs. William H. Brearley, New York; Mrs. Charles A. Dyer, Maine; Mrs. Alfred Russell, Michigan; Mrs. Nelson V. Titus, Massachusetts; Mrs. Western Bascome, Missouri; Mrs. Sullivan Johnson, Pennsylvania.

The 18 honorary vice-presidents national in honor of the 18 States in the Union at the time of the War of 1812 are as follows: Mrs. Louis J. Allen, Mrs. A. M. Bailey, Mrs. Braxton Bragg, Mrs. William H. Brearley, Mrs. Jefferson Davis, Mrs. J. C. Fremont (deceased), Miss Elizabeth Benton Fremont, Mrs. James A. Garfield, Mrs. Ulysses S. Grant (deceased), Miss

Mary Grace Hall, Mrs. J. D. Iglehart, Mrs. Sullivan Johnson, Mrs. William Lee, Mrs. William A. McKinley, Mrs. Edward Roby, Mrs. Russell Sage, Mrs. Nellie Grant Sartoris, Mrs. Letitia Tyler Semple, Mrs. William Gerry Slade, Mrs. Leroy Sunderland Smith.

MRS. WILLIAM GERRY SLADE,
National President and New York State President.

United States, Decorative Art in. See DECORATIVE ART IN THE UNITED STATES.

United States Indian Training and Industrial School, at Carlisle, Pa. It was established on the present site in 1879; but its real beginning was in 1875, when 74 Indians were brought as prisoners of war to Fort Marion, Saint Augustine, Fla. When put to work at the fort they proved intelligent and trustworthy, and their skill as workmen aroused the interest of some of the women of Saint Augustine, who established a school for them and taught them English. In 1878, when their term of confinement was over, 22 asked to stay in the East to attend school, 17 of whom were placed at Hampton Institute; Capt. R. H. Pratt of the United States army was then authorized to bring 50 more Indians from the Dakota reservation to Hampton. He soon found that a separate school for the Indians was desirable, and the abandoned army post at Carlisle was assigned for the uses of a school in 1879. In October of that year he brought the first Indian pupils to Carlisle. The aim of the school has always been to prepare the Indians to take part in the life of a civilized community as citizens on an equality with other citizens, and thus to free them from especial and separate supervision. The courses offered are of elementary and secondary grade, and are grouped about four central subjects, the English language, history and literature, science, and form and number (including geometry and algebra). There are also excellent music and art departments. A normal department was organized in 1894 and provides instruction in psychology (elementary), pedagogics, history of education, and methods of teaching sloyd, with practice work. The industrial work is a prominent feature, half the school day being devoted to some productive industry. Instruction and practice is given in carpentry, blacksmithing, painting, harness-making, tinsmithing, shoe-making, laundry work, hospital and nurse work, sewing, household and domestic economy (including special course in bread-making), farming and dairying. Another important part of the work is the systematic physical training, gymnastic classes being arranged for boys and girls in all grades; athletic sports are also encouraged, and the football team has a national reputation for excellent playing. The most distinctive feature of the school is the "outing system," by which the school requires all its students to spend at least one year in some white family under the supervision of the school. During the winter they attend the public school in their neighborhood, and when not in school receive regular wages for work on the farm or in the home; a portion of these wages is placed in the school bank and draws interest. This system, which has been in force since the beginning of the schools, has proved eminently successful; the Indians have been pleasantly welcomed in the homes to which they go, and have proved themselves, as a rule, helpful and congenial members of the family. Over 800 pupils are sent out every summer, and about half that number remain out every winter. The aim of this system is to enable the Indians to gain direct, personal experience in self-support by honest work, and an insight into the responsibilities and amenities of civilized family and institutional life in its best and most attractive forms. The united earnings of the students who were working outside, in 1902–3, amounted to $31,393. A weekly paper, 'The Red Man and Helper,' is printed in the school shop by Indians. The school is under the control of the Indian Office of the United States government, and is supported by government appropriation. The students in 1904 numbered 1,069; the total enrolment since the beginning was 5,135.

United States Military Academy. See MILITARY ACADEMY, UNITED STATES.

United States National Museum, a national depository for scientific and historical collections under the administration of the Smithsonian Institute (q.v.), located at Washington, D. C. The beginning of the museum was Smithson's cabinet of minerals, and other collections gathered by exploring expeditions, which had been placed under the charge of the Smithsonian Institute by the act establishing it in 1846. The name of United States National Museum was not adopted until 1876, when the Smithsonian Institute added to the collections already made the exhibits prepared to illustrate the resources and ethnology of the United States at the Centennial Exhibition, together with a large amount of material presented by 34 foreign nations. In 1879 Congress appropriated $250,000 for a museum building; but this has for some time been inadequate for the proper housing of the collections, and a new building was provided for in 1903 by the appropriation of $3,500,000. The chief means of adding to the collection are by the specimens gathered by government explorations and surveys, by exchanges, by gift, and by limited purchases provided for in the Congressional appropriation. The museum is under the general direction of the secretary of the Smithsonian Institute, and under the special charge of an assistant secretary and curators, appointed by the secretary; and receives an annual appropriation from the government. Its collections are naturally best for matters relating to North America; the material illustrating the arts and occupations of the American Indians and the fisheries of the United States is particularly valuable; and the historical collections containing personal relics of famous Americans are interesting. The Museum publishes 'Proceedings' and an 'Annual Report,' containing scientific articles describing or illustrating the collections; aid is also given to students in using the collections for purposes of scientific research.

United States Naval Academy. See NAVAL ACADEMY, UNITED STATES.

United States Naval Observatory, The. See NAVAL OBSERVATORY, THE UNITED STATES.

United States Navy. See NAVY OF THE UNITED STATES.

United States, Painters of. We must look upon Benjamin West (1738–1820) as the first of the American painters. Of course art on the American continent in his days was an exotic, and most of West's life was spent in London; yet he was born in Pennsylvania and early brought up under American influences and did not go to London until he was 25 years of age. He painted history and portraits, and his influence on the English school of painting was certainly of transatlantic origin, for he taught them to abandon such conventionalities as the use of classic costume in the treatment of heroic subjects of modern time like the 'Death of Nelson' and the 'Death of General Wolfe'. It must, however, be said that his compositions were over-studied and not natural; the action conventional and melodramatic; the draperies, though learned, heavy and untrue; his color deficient in freshness and variety. His figures are often vapid and without character; yet he preserved a certain dignity and consistency in the treatment of his subjects which almost raised his mediocrity to excellence. Perhaps his best works are his life-sized portraits and family groups, and his greatest misfortune was that he left the new world for the old and submitted himself to the conventionalities of London instead of working out a new field in the life of his native land. One of his best and most natural pictures, 'Penn's Treaty with the Indians,' was sold in 1851 for $2,200. To be classed with West as one of the early painters of the United States is Gilbert Stuart (1755–1828) (q.v.), of whom West was an early patron. Stuart made himself immortal by his masterly portraits of George Washington, the first President of the United States. In the many likenesses which he executed of this great personage he has shown himself an illustrious member of that English school which includes the names of Gainsborough, Reynolds, and Lawrence. An American painter of the same period was John Trumbull (1756–1843), who painted the 'Battle of Bunker Hill,' and whose pictures are familiar to all visitors of the Capitol at Washington.

Washington Allston (q.v.) (1779–1843) was born in South Carolina and was, like American artists of that period, a painter of scriptural and heroic subjects. From his use of color and light he has been styled "The American Titian." He was intimate with Thorwaldsen and Coleridge, and the latter said of him, that he was surpassed by no man of his age in artistic and poetic genius. It must, however, be said of him that his grandeur of conception was often superior to his power of execution.

John Singleton Copley (1737–1815) must be considered as belonging to the same group of American painters, although he left the United States in middle life. He was encouraged in London by the generous benevolence of West, who never overlooked a fellow countryman. He was made a member of the London Royal Academy in 1779, and although he had been almost self-taught his work was much superior to that of many academicians. His principal pictures representing historic events and containing many portraits will always be valuable, and his 'Death of Major Pearson' was bought for the National Gallery in 1864 for the sum of $8,000.

American Landscape.—As soon as American painting cast itself free from the traditions of Europe there was developed a great school of landscape painting. The glories of American scenery immediately claimed the attention of the pencil and the brush.

Thomas Cole (1801–48) was the founder of what is known as the Hudson River school. Although born in England he removed to the United States in his 18th year and all his best landscapes were those chosen from American scenery. Among his contemporaries and successors were Frederick Edwin Church, Albert Bierstadt and Bradford, who were especially remarkable for their representations of abnormal landscape effects such as they discovered in Arctic scenery, in the mountains of South America and the bizarre glories of the Yellowstone Park. Their pictures produced a profound sensation both in Europe and America, though many of them were more conspicuous for the strange and startling features of the natural scenery which they portrayed than for the originality of treatment or imaginative power which they displayed. The freshest and most original painter whose earliest work shows the influence of Cole and of the Hudson River school, was Georges Inness, who proved himself capable of producing work which did not rely for its success upon mere panoramic size or grandeur of distance. Inness, to judge from his 'Berkshire Hills,' 'Sunshine and Clouds,' was profoundly influenced in his work by the genius of the Barbizon school. He was of a religious temperament, and in many of his paintings we are struck by a deep thoughtfulness, a half melancholy feeling after the supernatural, such as are conspicuous features in the works of Corot. Although his 'Midsummer' is elaborated with the most profound knowledge of tonality and a remarkable power of atmospheric lucidity it is almost impressionistic in freshness and offhandedness. Yet Inness is credited with the remark, "While pre-Raphaelism is like a measure worm trying to compass the infinite circumference, impressionism is the sloth enveloped in its own eternal dullness."

There are three names which should be grouped together as representative of the genuine American spirit of independence and discovery in modern painting. George Inness was a member of this group, and by his side stood Whistler and John La Farge. La Farge is indeed one of the most striking personalities in the history of American painting. Even though his daughtsmanship sometimes emphasizes expression at the expense of academic correctness, he has something of that versatility which we associate with the artists of the Renaissance. He is a writer and a thinker. He has the artificer's love of effect as represented in glass and metal. While he can rise on the wings of poetry and devotion to the conception and execution of great religious paintings, he revels in the sparkling combinations of tinted crystals and brass work, and as an art theorist had the happy power of thinking out, expressing in words and thoroughly trusting his own sensations — a power of isolation and independence rarely to be found excepting in artists of the first genius. The same faculty belongs to the life of James A. McNeill Whistler. He was a pathfinder and a discoverer. He was for instance, among those who found out and ex-

pounded the significance of Velasquez and Rembrandt as sources of inspiration in modern art, and who by practical example taught English and American artists to recognize reality in the art of China and Japan. His 'Portrait of My Mother' must be looked upon as embodying not only his intensity of conception, his brilliant simplicity of execution, but also his sweetness and devotional tenderness of mind. His landscape studies, or symphonies as he chose to call them, testify to his craving for abstract expression in art. His etchings approach in their suggestiveness and freedom of touch to that perfection which before him had been monopolized by the Dutch school, and it is not too much to say that in daring originality and simplicity, earnestness and absolute grandeur Whistler stands alone among the artists of his century.

The works of John Singer Sargent were very happily represented to the eyes of the American public by the exhibition of his works which was given in Copley Hall, Boston, in 1899. He was then about 40 years of age, and in his 125 portraits and sketches appeared what was worthy to be reckoned the production of a lifetime. A second exhibition held at the same city, 1904, contained later works of still more extraordinary value. We see in his pictures more perhaps than in those of any of his contemporaries that a genuine American school of painting does actually exist. His virtuosity, the tricks of his technique, may be French, but the pose, the handling, the unconventional arrangement are distinctly American. The assurance and certainty with which he treats the most hackneyed subjects are inspired by the fresh breezes of the West, and the mark which he has made in art circles on both sides of the Atlantic is due to his great faculty of combining in a portrait the individualism of the sitter in posture and expression with the suggestiveness of harmonious accessories. His most permanent claim to artistic glory will ultimately rest upon his mural paintings in the Boston Public Library, some of which are unsurpassed for power, dignity and decorative effect by any work of the kind executed in the 19th or 20th century.

A great number of American painters have passed over into the European school and have quickly assimilated the style and technique of French and German masters. The crowd of American gentlemen who paint with ease has thus been multiplied. The American Gérôme and the American Piloty have appeared over and over again, and Breton fisher girls and German historic pictures signed by artists from New York, Boston or Philadelphia have become monotonously tedious. It is therefore refreshing to come upon work like that of Winslow Homer, who appears in this country as among the forceful and individual men who refuse to be hampered by a foreign convention. No one can refuse this artist the title of American painter. As a boy at Cambridge, Mass., he led the out-of-door life which made him acquainted with nature in sky, in land and animated life. In early manhood he represented 'Harper's Magazine' as a war artist. As a landscape painter he spent for many years the life of a recluse on the coast of Maine. Some of his most powerful, most original pictures are inspired by the scenery with which he was surrounded in his lonely hermitage at Scarboro. His 'West Wind' and 'The Maine Coast' are among the most genuine and suggestive of American landscapes, although in dimensions, distance and panoramic comprehensiveness they are mere vignettes, snap-shots which the modest eye of the painter has taken in and transferred without dramatic grouping or artistic comment to his imperishable canvas. It is somewhat difficult to classify Edwin A. Abbey among contemporary American artists. Probably he will be taken and placed in a niche among the immortals as a supremely successful illustrator. There are some artists whose strength lies in presenting the ideal in concrete form. They take up some figure of religion or mythology and embody by their pencil the 'Immaculate Conception' or the 'Muses on Helicon.' There are others who conceive their own story and tell it as Millais in his 'Order of Release' or his 'Autumn Leaves.' There is a third class of painters who choose some of the most salient incidents of poetic or historic literature and represent it in line and color. To this last class of painters belongs Edwin A. Abbey. We do not realize until we see his pictures what an immense field for imagination is to be found in this sphere of artist activity. Indeed, we are made to feel in seeing the marvellous creations of Abbey that he has added something to the beauty and dignity of every episode which he has illustrated. His interpretations of Shakespeare and Goldsmith, of Sir Thomas Malory and Robert Herrick prove that he veritably shares and enlarges the romantic mood of the author whose words and music he has transformed into vivid pictures of life. His decorations of the Boston Public Libary constitute a monument of American art in which are blended all the religious sentiment, the chivalric enthusiasm and the archæological learning which have been presented to the world by the intellectual activity and serious energy of the 19th century, but as wall paintings they are patchy and lack continuity and harmoniousness of general effect.

A most curious and interesting figure in American art history is that of George Fuller, born at Deerfield, Mass., in 1822. His life on a farm familiarized him with the features of external nature and probably this experience prompted his declaration in which self-reliance is blended with artistic sincerity. "I have concluded to see nature for myself, through the eyes of no one else, and put my trust in God, awaiting the result." This clear and simple mood of mind well fitted him for the work which he has done in American art. His life including his 15 years' work on a farm, during which period his pictures were unseen by the public, reads like a romance. His bankruptcy as a tobacco grower forced him in 1875 to come out as a painter, when he made a reputation and a living as a producer of beautiful and suggestive pictures. His 'By the Way Side,' 'Turkey Pasture in Kentucky,' 'The Quadroon,' and his nude 'Arethusa' exhibit the wide extent of his capacity and the remarkable skill and learning of this genuine artist.

Among American landscapists must be mentioned Homer D. Martin, whose work rises far above that of all others of the Hudson River

school. He paints in two moods, one of which is impressionistic, the other thoughtful and interpretative. The first is seen in his naturalistic picture 'Westchester Hills,' the second in his somewhat fanciful painting 'The Sun Worshipers,' in which the trees on a ridge of hills are bending under a western breeze before the rising sun. What is most lovable in Martin's pictures is the infinite and tender expanse of his skies. These skies tremble and quiver with light. His clouds are moving fleets of luminous vapor. To the picture lover Homer D. Martin stands on the highest pinnacle of American poetic painters.

George D. Forrest Brush is one of the students of Gérôme who has perhaps more than any other American artist reflected the particular genius of his master. His creations are characterized by singular novelty and imaginative force. Take, for instance, 'His Silence Broken.' Here we see a glimpse of river — dense forests on either side — an Indian in a canoe turning up his face startled by the cry of a wild goose bursting from the covert and passing by overhead. The genuineness, the cleverness, the directness of this representation would be enough to establish an artist's reputation in any age.

Among American landscape painters — of men, that is, who paint external nature in such a way as to produce a composition — Alexander H. Wyant will always hold a prominent place. The School of Poussin and Claude Lorraine has left a host of imitators, and perhaps the Hudson River school were too much under the influence of these European masters who sought in a landscape the symmetry and perspective of an architectural structure or a dramatic group of figures. In Wyant we find a certain remarkable combination of the grandeur of Salvator Rosa and the realism of the camera. A good example of his work is 'The Mohawk Valley,' and of his more subtile and imaginative mood we may find represented in his remarkable 'Moonlight and Frost.' He must be looked upon as the most triumphant impressionist of the American school. Among those who share his honors in this particular may be mentioned Julian Alden Weir.

Dwight W. Tryon is a New Englander by birth, and his work seems to suggest the possession of those qualities which are generally credited to the New England character. What is the most remarkable in all recent American art is the absence of anything like definite exposition; the artist seems to take the spectator by the hand and to say help me to interpret this. He portrays the mysterious light and shade, the masses and outlines of the landscape with the most faithful, the most passionate devotion. But he will not interpret it excepting so far as his unconscious mood leads him to do so. Of such painters Tryon is a brilliant example. The American temperament is here typically represented; his works have largeness and boldness combined with the utmost subtility and refinement of detail.

Horatio Walker must be classed as one of the leading American painters of this period. In some respects he resembles Moreland, although quite superior to the slovenliness and quite equal to the truthfulness and sympathetic treatment of that great artist. His 'Milking' is quite characteristic of his style. Here we find a stable interior, with dull brown walls. A woman dressed in blue is milking a black and white cow, while the calf is standing by. The light enters by a window on the right and seems to sift through the dust of the stable.

In writing a history of American Art we have thus briefly alluded to some of its masters. For the account of Vanderlyn, Twachtman, Smedley, Edward Simmons, E. H. Blashfield, Will H. Low, Elihu Vedder, Chas. Y. Turner, Chas. Sprague Pierce, and others who have made American painting illustrious, we refer to the biographies given elsewhere.

Revised by RUSSELL STURGIS.

United States Presidential Candidates. Since the establishment of the government of the United States there have been several important changes in the method of electing the candidates for the offices of President and Vice-President. Prior to 1804, for example, each elector voted for two candidates for the Presidency. The one who received the largest number of votes was then declared elected, while the candidate receiving the second largest electoral vote filled the office of Vice-President. Thus as the electoral vote at the first election showed 69 ballots for George Washington and 34 for John Adams, General Washington became the first President of the new republic, while the defeated Adams was declared its Vice-President.

During the first quarter of a century of its national existence practically no "direct" vote was cast for the election of the two chief executives of the United States. Instead of selecting the electors by a "direct" vote — as is the case at the present day — in nearly all States, the electors were "appointed" by the Legislature, a fact which makes it extremely difficult, if not absolutely impossible, to obtain any accurate figures which might indicate the strength of popular opinion at any of the national elections prior to 1824, by which time the choice of electors by the "direct" vote of the people had become general throughout the Union.

It was not until 1804 that electors cast their vote for both a President and a Vice-President instead of for the two candidates for the Presidency, for it was during Thomas Jefferson's first term that this matter was so widely agitated that a necessary Constitutional amendment was adopted providing for the methods of election which now prevail in all parts of the country.

Although, from an official point of view, there is no such thing as a popular vote for the election of President and Vice-President the ballots cast in the various States for the several electors is always regarded as the "direct" expression of popular opinion, and as the number of such electors are apportioned among the several States upon a basis in keeping with the growth of population it is not strange that the popular vote and the electoral vote should not always agree in their results. In 1824, for example, as in 1888, the candidate who was defeated by the electoral college was the one who had received the largest "direct" vote. So, too, in 1876, when the dispute over the electoral vote of several of the Southern States was referred to the Congressional electoral committee, the choice of Hayes defeated Tilden, a man who had received almost 300,000 more votes from the people.

UNITED STATES PRESIDENTIAL CANDIDATES

PRESIDENTIAL CANDIDATES OF THE UNITED STATES, 1789–1904.

Election Year	Name of Candidate	State Represented	Party Represented	Electoral Vote	Popular Vote	State and Date of Birth	State and Date of Deatb
1789	George Washington	Va.	.....	69	.....	Va., *22* Feb. 1732	Va., 14 Dec. 1799
	John Adams	Mass.	.....	34	.....	Mass., 30 Oct. 1735	Mass., 4 July 1826
	John Jay	N. Y.	.....	9	.....	N. Y., 12 Dec. 1745	N. Y., 17 May 1829
	R. H. Harrison	Md.	.....	6	.....	Md., ——— 1745	Md., 2 April 1790
	John Rutledge	S. C.	.....	6	.....	S. C., ——— 1739	S. C., 23 July 1800
	John Hancock	Mass.	.....	4	.....	Mass., 12 Jan. 1737	Mass., 8 Oct. 1793
	George Clinton	N. Y.	.....	3	.....	N. Y., 26 July 1739	D. C., 20 April 1812
	Samuel Huntington	Conn.	.....	2	.....	Conn., ——— 1732	Conn., 5 Jan. 1796
	John Milton	Ga.	.....	2	.....	Ga., ——— 1740	
	James Armstrong	Ga.	.....	1	.....		Pa., 3 Sept. 1795
	Benjamin Lincoln	Mass.	.....	1	.....	Mass., 24 Jan. 1733	Mass., 9 May 1810
	Edward Telfair	Ga.	.....	1	.....	Va., ——— 1735	Ga., 17 Sept. 1807
1792	George Washington	Va.	Fed.	132	.....	(Above)	(Above)
	John Adams	Mass.	Fed.	77	.....	(Above)	(Above)
	George Clinton	N. Y.	Rep.(1)	50	.....	(Above)	(Above)
	Thomas Jefferson	Va.	Rep.	4	.....	Va., 2 April 1743	Va., 4 July 1826
	Aaron Burr	N. Y.	Rep.	1	.....	N. J., 6 Feb. 1756	N. Y., 14 Sept. 1836
1796	John Adams	Mass.	Fed.	71	.....	(Above)	(Above)
	Thomas Jefferson	Va.	Rep.	68	.....	(Above)	(Above)
	Thomas Pinckney	S. C.	Fed.	59	.....	S. C., 23 Oct. 1750	S. C., 2 Nov. 1828
	Aaron Burr	N. Y.	Rep.	30	.....	(Above)	(Above)
	Samuel Adams	Mass.	Rep.	15	.....	Mass., *27* Sept. 1722	Mass., 2 Oct. 1803
	Oliver Ellsworth	Conn.	Ind.	11	.....	Conn., 29 April 1745	Conn., 26 Nov. 1807
	George Clinton	N. Y.	Rep.	7	.....	(Above)	(Above)
	John Jay	N. Y.	Fed.	5	.....	(Above)	(Above)
	James Iredell	N. C.	Fed.	3	.....	N. C., 2 Nov. 1788	N. C., 13 April 1853
	George Washington	Va.	Fed.	2	.....	(Above)	(Above)
	John Henry	Md.	Fed.	2	.....	Md., ——— 1750	Md., 16 Dec. 1798
	S. Johnson	N. C.	Fed.	2	.....	——— ——— 1733	N. C., 18 Aug. 1816
	C. C. Pinckney	S. C.	Fed.	1	.....	S. C., 25 Feb. 1746	S. C., 16 Aug. 1825
1800	Thomas Jefferson	Va.	Rep.	73(2)	.....	(Above)	(Above)
	Aaron Burr	N. Y.	Rep.	73(2)	.....	(Above)	(Above)
	John Adams	Mass.	Fed.	65	.....	(Above)	(Above)
	C. C. Pinckney	S. C.	Fed.	64	.....	(Above)	(Above)
	John Jay	N. Y.	Fed.	1	.....	(Above)	(Above)
1804	Thomas Jefferson	Va.	Rep.	162	.....	(Above)	(Above)
	C. C. Pinckney	S. C.	Fed.	14	.....	(Above)	(Above)
1808	James Madison	Va.	Rep.	122	.....	Va., 27 Aug. 1749	Va., 6 Mar. 1812
	C. C. Pinckney	S. C.	Fed.	47	.....	(Above)	(Above)
	George Clinton	N. Y.	Rep.	6	.....	(Above)	(Above)
1812	James Madison	Va.	Rep.	128	.....	(Above)	(Above)
	DeWitt Clinton	N. Y.	Fed.	89	.....	N. Y., 2 Mar. 1769	N. Y., 11 Feb. 1826
1816	James Monroe	Va.	Rep.	183	.....	Va., 28 April 1758	N. Y., 4 July 1831
	Rufus King	N. Y.	Fed.	34	.....	Me., 24 Mar. 1755	N. Y., 29 April 1827
1820	James Monroe	Va.	Rep.	228	.....	(Above)	(Above)
	John Quincy Adams	Mass.	Rep.	1	.....	Mass., 11 July 1767	D. C., 23 Feb. 1848
1824	John Quincy Adams	Mass.	Rep.	84(2)	108,740	(Above)	(Above)
	Andrew Jackson	Tenn.	Dem.	99(2)	153,544	N. C., 15 Mar. 1767	Tenn., 8 June 1845
	W. H. Crawford	Ga.	Rep.	42	47,136	Va., 12 April 1777	D. C., 29 June 1852
	Henry Clay	Ky.	Rep.	37	46,618	Va., 24 Feb. 1772	Ga., 15 Sept. 1834
1828	Andrew Jackson	Tenn.	Dem.	178	647,286	(Above)	(Above)
	John Quincy Adams	Mass.	Nat. Rep.	83	508,064	(Above)	(Above)
1832	Andrew Jackson	Tenn.	Dem.	219	687,502	(Above)	(Above)
	Henry Clay	Ky.	Nat. Rep.	49	530,189	(Above)	(Above)
	John Floyd	Ga.	Ind.	11	.....	Va., ——— 1770	Va., 16 Aug. 1837
	William Wirt	Md.	Anti-Mas.	7	.....	Md., 8 Nov. 1772	D. C., 18 Feb. 1834
1836	Martin Van Buren	N. Y.	Dem.	170	762,678	N. Y., 5 Dec. 1782	N. Y., 24 July 1862
	William H. Harrison	Ohio	Whig	73	.....	Va., 9 Feb. 1773	D. C., 4 April 1841
	Hugh L. White	Tenn.	Whig	26	735,651	N. C., ——— 1773	Tenn., 10 April 184c
	Daniel Webster	Mass.	Whig	14	.....	N. H., 18 Jan. 1782	Mass., 24 Oct. 1852
	W. P. Mangum	N. C.	Whig	11	.....	N. C., ——— 1792	N. C., 14 Sept. 1861
1840	William H. Harrison	Ohio	Whig	234	1,275,016	(Above)	(Above)
	Martin Van Buren	N. Y.	Dem.	60	1,129,102	(Above)	(Above)
	James G. Birney	N. Y.	Liberty	.....	7,069	Ky., 4 Feb. 1792	N. J., 25 Nov. 1857
1844	James K. Polk	Tenn.	Dem.	170	1,337,243	N. C., 2 Nov. 1795	Tenn., 15 June 1849
	Henry Clay	Ky.	Whig	105	1,299,062	(Above)	(Above)
	James G. Birney	N. Y.	Liberty	.....	62,300	(Above)	(Above)
1848	Zachary Taylor	La.	Whig	163	1,360,099	Va., 24 Sept. 1784	D. C., 9 July 1850
	Lewis Cass	Mich.	Dem.	127	1,220,544	N. H., 9 Oct. 1782	Mich., 17 June 1866
	Martin Van Buren	N. Y.	F. S.	.....	291,263	(Above)	(Above)
1852	Franklin Pierce	N. H.	Dem.	254	1,602,274	N. H., 23 Nov. 1804	N. H., 8 Oct. 1869
	Winfield Scott	N. J.	Whig	42	1,386,580	Va., 13 June 1786	N. Y., 29 May 1866
	John P. Hale	N. H.	Free Dem.	.....	155,825	N. H., *31* Mar. 1806	N. H., 19 Nov. 1873
	Daniel Webster	Mass.	Whig	.....	1,670	(Above)	(Above)
1856	James Buchanan	Pa.	Dem.	174	1,838,169	Pa., *22* April 1791	Pa., 1 June 1868
	John C. Fremont	Cal.	Rep.	114	1,341,264	Ga., *21* Jan. 1813	N. Y., 13 July 1890
	Millard Fillmore	N. Y.	Amer.	8	874,534	N. Y., 7 Feb. 1800	N. Y., 8 Mar. 1874
1860	Abraham Lincoln	Ill.	Rep.	180	1,866,452	Ky., 12 Feb. 1809	D. C., 15 April 1865
	J. C. Breckinridge	Ky.	Dem.	72	847,953	Ky., *21* Jan. 1821	Ky., 17 May 1875
	Stephen A. Douglas	Ill.	U. Dem.	39	1,375,157	Vt., *23* April 1813	Ill., 3 June 1861
	John Bell	Tenn.	Cons. U.	12	590,631	Tenn., 15 Feb. 1797	Tenn., 10 Sept. 1869
1864	Abraham Lincoln	Ill.	Rep.	212	2,213,665	(Above)	(Above)
	George B. McClellan	N. J.	Dem.	21	1,802,237	Pa., 3 Dec. 1826	N. J., 29 Oct. 1885
1868	Ulysses S. Grant	Ill.	Rep.	214	3,012,833	Ohio, *27* April 1822	N. Y., 23 July 1885
	Horatio Seymour	N. Y.	Dem.	80	2,703,249	N. Y., 31 May 1810	N. Y., 12 Feb. 1886
1872	Ulysses S. Grant	Ill.	Rep.	286	3,597,132	(Above)	(Above)
	Horace Greeley	N. Y.	D. & L.	(3)	2,834,125	N. H., 3 Feb. 1811	N. Y., 29 Nov. 1872
	Charles O'Conor	N. Y.	Dem.	.....	29,489	N. Y., *22* Jan. 1804	Mass., 12 May 1884
	James Black	Pa.	Temp.	.....	5,608	Pa., *23* Sept. 1823	Pa., 16 Dec. 1803
	Thomas A. Hendricks	Ind.	Dem.	42	(3)	Ohio, 7 Sept. 1819	Ind., 25 Nov. 1885
	B. Gratz Brown	Mo.	Dem.	18	(3)	Ky., *28* May 1826	Mo., 13 Dec. 1885
	Charles J. Jenkins	Ga.	Dem.	2	(3)	S. C., 6 Jan. 1805	Ga., 13 June 1883

UNITED STATES PRESIDENTIAL CANDIDATES

Election Year	Name of Candidate	State Represented	Party Represented	Electoral Vote	Popular Vote	State and Date of Birth	State and Date of Death
	David Davis	Ill.	Ind.	1	.....	Md., 9 Mar. 1815	Ill., 26 June 1886
1876	Rutherford B. Hayes	Ohio	Rep.	185	4,036,298	Ohio, 4 Oct. 1822	Ohio, 17 Jan. 1893
	Samuel J. Tilden	N. Y.	Dem.	184	4,300,590	N. Y., 9 Feb. 1814	N. Y., 4 Aug. 1886
	Peter Cooper	N. Y.	Greenback	.....	81,737	N. Y., 12 Feb. 1791	N. Y., 4 April 1883
	Green Clay Smith	Ky.	Pro.	.....	9,522	Ky., 2 July 1832	Ky., 29 June 1895
	James B. Walker	Ill.	Amer.	.....	2,636		
1880	James A. Garfield	Ohio	Rep.	214	4,454,416	Ohio, 19 Nov. 1831	N. J., 19 Sept. 1881
	Winfield S. Hancock	Pa.	Dem.	155	4,444,952	Pa., 14 Feb. 1824	N. Y., 9 Feb. 1886
	James B. Weaver	Ia.	Greenback	.....	308,578	Ohio, 12 June 1833	
	Neal Dow	Me.	Pro.	.....	10,305	Me., 20 Mar. 1804	Me., 2 Oct. 1897
	John W. Philips	Vt.	Amer.	.....	707	Vt., 13 Nov. 1813	
1884	Grover Cleveland	N. Y.	Dem.	219	4,874,986	N. J., 18 Mar. 1837	
	James G. Blaine	Me.	Rep.	182	4,851,981	Pa., 31 Jan. 1830	D. C., 27 Jan. 1893
	John P. St. John	Ky.	Pro.	.....	150,369	Ind., 25 Feb. 1833	
	Benjamin F. Butler	Mass.	People's	.....	175,370	N. H., 5 Nov. 1818	D. C., 11 Jan. 1893
	P. D. Wigginton	Cal.	Amer.	.....	.....		
1888	Benjamin Harrison	Ind.	Rep.	233	5,439,853	Ohio, 20 Aug. 1833	
	Grover Cleveland	N. Y.	Dem.	168	5,540,309	(Above)	
	Clinton B. Fisk	N. J.	Pro.	.....	249,506	N. Y., 8 Dec. 1828	N. Y., 9 July 1890
	Alson J. Streeter	Ill.	Union L.	.....	146,935	N. Y., ——— 1823	Ill., 24 Nov. 1901
	James L. Curtis	N. Y.	Amer.	.....	1,591	Conn., 19 Feb. 1816	
1892	Grover Cleveland	N. Y.	Dem.	277	5,554,437	(Above)	(Above)
	Benjamin Harrison	Ind.	Rep.	145	5,175,287	(Above)	(Above)
	James B. Weaver	Iowa	People's	22	1,041,028	(Above)	(Above)
	John Bidwell	Cal.	Nat. Dem.	.....	264,133	N. Y., 5 Aug. 1819	Cal., ——— 1900
	Simon Wing	Mass.	Pro.	.....	21,164		
1896	William McKinley	Ohio	Rep.	271	7,102,272	Ohio, 29 Jan. 1843	N. Y., ———
	William J. Bryan	Neb.	Dem.&Peo.	176	6,273,624	Ill., 19 Mar. 1860	
	John M. Palmer	Ill.	Nat. Dem.	.....	133,148	Ky., 13 Sept. 1817	
	Joshua Levering	Md.	Pro.	.....	132,007	Md., 12 Sept. 1845	
	Charles H. Matchett	N. Y.	Soc. L.	.....	36,274	Mass., 15 May 1843	
	Charles E. Bentley	Neb.	Nat.	.....	13,969	N. Y., 30 April 1841	
1900	William McKinley	Ohio	Rep.	292	7,219,101	(Above)	(Above)
	William J. Bryan	Neb.	Dem.&Peo.	155	6,357,054	(Above)	(Above)
	John G. Woolley	Ill.	Pro.	.....	208,187	Ohio, 15 Feb. 1850	
	Eugene V. Debs	Ind.	Soc. Dem.	.....	99,613	Ind., 5 Nov. 1855	
	Wharton Barker	Pa.	M. R. P.	.....	51,585	Pa., 1 May 1846	
	Joseph F. Malloney	Mass.	Soc. L.	.....	33,413	R. I., ——— 1863	
	Seth H. Ellis	Ohio	U. R.	.....	5,698	Ohio, 3 Jan. 1830	
	J. F. R. Leonard	Iowa	U. C.	.....	1,059	Pa., 10 Dec. 1832	
1904	Theodore Roosevelt	N. Y.	Rep.	336	7,624,982	N. Y., 27 Oct. 1858	
	Alton B. Parker	N. Y.	Dem.	140	5,112,565	N. Y., 14 May 1852	
	Eugene V. Debs	Ind.	Soc.	.....	406,442	(Above)	(Above)
	Silas C. Swallow	Pa.	Pro.	.....	258,838	Pa., 5 May 1839	
	Thomas E. Watson	Ga.	People's	.....	120,003	Ga., 5 Sept. 1856	
	Charles H. Corregan	N. Y.	Soc. L.	.....	28,943	N. Y., 11 Dec. 1860	

(1) It is claimed that the present Democratic party is the outgrowth of the original Republican party. (2) Election decided by the vote of the House of Representatives. (3) Owing to the death of Mr. Greeley, the Democratic electoral votes were scattered.

VICE-PRESIDENTIAL CANDIDATES, 1804–1904.

Year	Name of Candidate	State Represented	Party Represented	Electoral Vote	State and Date of Birth	State and Date of Death
1804	George Clinton	N. Y.	Rep.	162	N. Y., 26 July 1739	D. C., 20 April 1812
	Rufus King	N. Y.	Fed.	14	Me., 24 Mar. 1755	N. Y., 29 April 1827
1808	George Clinton	N. Y.	Rep.	113	(Above)	(Above)
	Rufus King	N. Y.	Fed.	47	(Above)	(Above)
	John Langdon	N. H.	Fed.	9	N. H., ——— 1739	N. H., 18 Sept. 1819
	James Madison	Va.	Rep.	3	Va., 27 Aug. 1749	Va., 6 Mar. 1812
	James Monroe	Va.	Rep.	3	Va., 28 April 1758	N. Y., 4 July 1831
1812	Elbridge Gerry	Mass.	Rep.	131	Mass., 17 July 1744	D. C., 23 Nov. 1814
	Jared Ingersoll	Pa.	Fed.	86	Conn., ——— 1749	Pa., 31 Oct. 1822
1816	D. D. Tompkins	N. Y.	Rep.	183	N. Y., 21 June 1774	N. Y., 11 June 1825
	John E. Howard	Md.	Fed.	22	Md., 4 June 1752	Md., 12 Oct. 1827
	James Ross	Pa.	.....	5	Pa., 12 July 1762	Pa., 27 Nov. 1847
	John Marshall	Va.	.....	4	Va., 24 Sept. 1755	Pa., 6 July 1835
	Robert G. Harper	Md.	.....	3	Va., ——— 1765	Md., 15 July 1825
1820	D. D. Tompkins	N. Y.	Rep.	215	(Above)	(Above)
	Richard Stockton	N. J.	.....	8	N. J., 1 Oct. 1750	N. J., 28 Feb. 1821
	Daniel Rodney	Del.	.....	4	——— 1771	Del., 2 Sept. 1846
	Robert G. Harper	Md.	.....	1	(Above)	(Above)
	Richard Rush	Pa.	.....	1	Pa., 29 Aug. 1780	Pa., 30 July 1859
1824	John C. Calhoun	S. C.	Dem.	182	S. C., 18 Mar. 1782	D. C., 31 Mar. 1850
	Nathan Sanford	N. Y.	Rep.	30	N. Y., 5 Nov. 1779	N. Y., 17 Oct. 1838
	Nathaniel Macon	N. C.	Rep.	24	N. C., ——— 1757	N. C., 29 June 1837
	Andrew Jackson	Tenn.	Dem.	13	N. C., 15 Mar. 1767	Tenn., 8 June 1845
	Martin Van Buren	N. Y.	Dem.	9	N. Y., 5 Dec. 1782	N. Y., 24 July 1862
	Henry Clay	Ky.	Rep.	2	Va., 12 April 1777	D. C., 29 June 1852
	John C. Calhoun	S. C.	Dem.	171	(Above)	(Above)
1828	Richard Rush	Pa.	Nat. Rep.	83	(Above)	(Above)
	William Smith	N. C.	Dem.	7	N. C., ——— 1762	Ala., 26 June 1840
1832	Martin Van Buren	N. Y.	Dem.	189	(Above)	(Above)
	John Sergeant	Pa.	Nat. Rep.	49	Pa., 5 Dec. 1779	Pa., 25 Nov. 1852
	Henry Lee	Mass.	Ind.	11	Mass., 4 Feb. 1782	Mass., 6 Feb. 1867
	Amos Ellmaker	Pa.	Anti-Masonic	7	Pa., 2 Feb. 1787	Pa., 28 Nov. 1851

UNITED STATES PRESIDENTIAL CANDIDATES

Year	Name of Candidate	State Represented	Party Represented	Electoral Vote	State and Date of Birth	State and Date of Death
	William Wilkins	Pa.	Dem.	30	Pa., 20 Dec. 1779	Pa., 23 June 1865
1836	Richard M. Johnson	Ky.	Dem.	147	Ky., 17 Oct. 1780	Ky., 19 Nov. 1850
	Francis Granger	N. Y.	Whig	77	Conn., 1 Dec. 1792	N. Y., 28 Aug. 1868
	John Tyler	Va.	Whig	47	Va., 29 Mar. 1790	Va., 18 Jan. 1862
	William Smith	Ala.	Dem.	23	(Above)	(Above)
1840	John Tyler	Va.	Whig	234	(Above)	(Above)
	Richard M. Johnson	Ky.	Dem.	48	(Above)	(Above)
	L. W. Tazewell	Va.	Dem.	11	Va., 17 Dec. 1774	Va., 6 Mar. 1860
	James K. Polk	Tenn.	Dem.	1	N. C., 2 Nov. 1795	Tenn., 15 June 1849
	Thomas Earle	Pa.	Liberty	.....	Mass., 21 April 1796	Pa., 14 July 1849
1844	George M. Dallas	Pa.	Dem.	170	Pa., 10 July 1792	Pa., 31 Dec. 1864
	T. Frelinghuysen	N. J.	Whig	105	N. J., 28 Mar. 1787	N. J., 12 April 1862
	Thomas Morris	Ohio	Liberty	.....	Va., 3 Jan. 1776	Ohio, 7 Dec. 1844
1848	Millard Fillmore	N. Y.	Whig	163	N. Y., 7 Feb. 1800	N. Y., 8 Mar. 1874
	William O. Butler	Ky.	Dem.	127	Ky., ——— 1791	Ky., 6 Aug. 1880
	Charles F. Adams	Mass.	F. Soil	.....	Mass., 18 Aug. 1807	Mass., 21 Nov. 1886
1852	William R. King	Ala.	Dem.	254	N. C., — April 1786	Ala., — April 1853
	William A. Graham	N. C.	Whig	42	N. C., 5 Sept. 1804	N. Y., 11 Aug. 1875
	George W. Julian	Ind.	F. Dem.	.....	Ind., 5 May 1817	Ind., 7 July 1899
1856	J. C. Breckenridge	Ky.	Dem.	174	Ky., 21 Jan. 1821	Ky., 17 May 1875
	William L. Dayton	N. J.	Rep.	114	N. J., 17 Feb. 1807	France, 1 Dec. 1864
	A. J. Donelson	Tenn.	Amer.	8	Tenn., 25 Aug. 1800	Tenn., 26 June 1871
1860	Hannibal Hamlin	Me.	Rep.	180	Me., 27 Aug. 1809	Me., 4 July 1891
	H. V. Johnson	Ga.	Dem.	12	Ga., 18 Sept. 1812	Ga., 16 Aug. 1880
	Joseph Lane	Ore.	Dem.	72	N. C., ——— 1801	N. C., 19 April 1881
	Edward Everett	Mass.	Union	39	Mass., 11 April 1794	Mass., 15 Jan. 1865
1864	Andrew Johnson	Tenn.	Rep.	212	N. C., 29 Dec. 1808	Tenn., 31 July 1875
	George H. Pendleton	Ohio	Dem.	21	Ohio, 25 July 1825	Belg'm, 24 Nov. 1889
1868	Schuyler Colfax	Ind.	Rep.	214	N. Y., 23 Mar. 1823	Minn., 13 Jan. 1885
	F. P. Blair, Jr.	Mo.	Dem.	80	Ky., 19 Feb. 1821	Mo., 9 July 1875
1872	Henry Wilson	Mass.	Rep.	286	N. H., 16 Feb. 1812	D. C., 22 Nov. 1875
	B. Gratz Brown	Mo.	D. & L.	47	Ky., 28 May 1826	Mo., 13 Dec. 1885
	John Quincy Adams	Mass.	Dem.	.....	Mass., 22 Sept. 1833	Mass., 14 Aug. 1894
	John Russell	Mich.	Temp.	.....		
	George W. Julian	Ind.	Liberty	5	(Above)	(Above)
	A. H. Colquitt	Ga.	Dem.	5	Ga., ——— 1824	
	John M. Palmer	Ill.	Dem.	3	Ky., 13 Sept. 1817	Ga., ——— 1894
	T. E. Bramlette	Ky.	Dem.	3	Ky., 3 Jan. 1817	
	W. S. Grocabeck	Ohio	Dem.	1	N. Y., 24 July 1815	Ky., 12 Jan. 1875
	Willis B. Machen	Ky.	Dem.	1		
	N. P. Banks	Mass.	Liberty	1	Mass., 30 Jan. 1816	
1876	William A. Wheeler	N. Y.	Rep.	185	N. Y., 30 June 1819	Mass., 1 Sept. 1894
	T. A. Hendricks	Ind.	Dem.	184	Ohio, 7 Sept. 1819	N. Y., 4 June 1887
	Samuel F. Cary	Ohio	Greenback	.....	Ohio, 18 Feb. 1814	Ind., 25 Nov. 1885
	Gideon T. Stewart	Ohio	Pro.	.....	N. Y., 7 Aug. 1824	
	D. Kirkpatrick	N. Y.	Amer.	.....		
1880	Chester A. Arthur	N. Y.	Rep.	214	Vt., 5 Oct. 1830	N. Y., 18 Nov. 1886
	William H. English	Ind.	Dem.	155	Ind., 27 Aug. 1822	Ind., 7 Feb. 1896
	B. J. Chambers	Tex.	Greenback	.....		
	H. A. Thompson	Ohio	Pro.	.....	Pa., 23 Mar. 1837	
	S. C. Pomeroy	Kan.	Amer.	.....	Mass., 3 Jan. 1816	Kan., 27 Aug. 1891
1884	T. A. Hendricks	Ind.	Dem.	219	(Above)	(Above)
	John A. Logan	Ill.	Rep.	182	Ill., 9 Feb. 1826	D. C., 26 Dec. 1886
	William Daniel	Md.	Pro.	.....	Md., 24 Jan. 1826	Md., 13 Oct. 1822
	A. M. West	Miss.	Greenback	.....		
1888	Levi P. Morton	N. Y.	Rep.	233	Vt., 16 May 1824	
	Allen G. Thurman	Ohio	Dem.	168	Va., 13 Nov. 1813	Ohio, 12 Dec. 1895
	John A. Brooks	Mo.	Pro.	.....		
	C. E. Cunningham	Ark.	Union L.	.....		
	W. H. T. Wakefield	Kan.	United L.	.....		
	James B. Greer	Tenn.	Amer.	.....		
1892	Adlai E. Stevenson	Ill.	Dem.	277	Ky., 23 Oct. 1835	
	Whitelaw Reid	N. Y.	Rep.	145	Ohio, 27 Oct. 1837	
	James G. Field	Va.	People's	.....	Va., ——— 1839	
	James B. Cranfill	Tex.	Pro.	.....		
	Charles H. Matchett	N. Y.	Soc. L.	.....	Mass., 15 May 1843	
1896	Garret A. Hobart	N. J.	Rep.	271	N. J., 3 June 1844	N. J., 21 Nov. 1899
	Arthur Sewall	Me.	Dem.	149	Me., 25 Nov. 1835	Me., 5 Sept. 1900
	Thomas E. Watson	Ga.	People's	27	Ga., 5 Sept. 1856	
	Hale Johnson	Ill.	Pro.	.....	Ind., 21 Aug. 1847	
	Simon B. Buckner,	Ky.	Nat. Dem.	.....	Ky., 1 April 1823	
	Matthew Maguire	N. J.	Soc. L.	.....	N. Y., ——— 1850	
	James H. Southgate	N. C.	Nat.	.....	Va., 12 July 1859	
1900	Theodore Roosevelt	N. Y.	Rep.	292	N. Y., 27 Oct. 1858	
	Adlai E. Stevenson	Ill.	Dem.	155	(Above)	
	Henry B. Metcalf	R. I.	Pro.	.....	Mass., ——— 1829	R. I., 10 Oct. 1904
	Ignatius Donnelly	Minn.	People's	.....	Pa., 3 Nov. 1831	Minn., 2 Jan. 1901
	Joh Harriman	Cal.	Soc. D.	.....	Ind., 15 Jan. 1861	
	Valentine Remmel	Pa.	Soc. L.	.....		
	John G. Woolley	Ill.	U. C.	.....	Ohio, 15 Feb. 1850	
	Samuel T. Nicholson	Pa.	U. R.	.....	N. C., 2 Feb. 1852	
1904	Charles W. Fairbanks	Ind.	Rep.	336	Ohio, 11 May 1852	
	Henry G. Davis	W. Va.	Dem.	140	Md., 16 Nov. 1823	
	George W. Carroll	Tex.	Pro.	.....	La., 11 April 1855	
	Thomas H. Tibbles	.....	People's	.....	Neb., ——— 1840	
	Benjamin Hanford	N. Y.	Soc.	.....	Ohio, ——— 1858	
	William W. Cox	Ill.	Soc. L.	.....	Ill., 5 Feb. 1864	

(1) Prior to 1804 each elector voted for two candidates for President. The person receiving the largest number of votes was elected, while the person receiving the next largest number of votes was declared Vice President. Then John Adams, of Massachusetts, was elected Vice President in 1789 and 1792; Thomas Jefferson, of Virginia, in 1796, and Aaron Burr, of New York, in 1800. In 1804, the Constitution of the United States having been amended, the electors voted for the Vice President as well as for President.

United States, Presidents of the. In the following tables the important facts concerning the various Presidents of the United States have been condensed for convenient reference. The first table gives the place of birth of each President, and, if a college man, the name of the college which graduated him. The second table gives the vocations of the Presidents and the length of service of each, and the third table gives the cause of death and the place of their burial. See also UNITED STATES — PRESIDENTS AND VICE-PRESIDENTS; UNITED STATES PRESIDENTIAL CANDIDATES; and the biography of each President in this encyclopedia.

NO. 1. BIRTH AND EDUCATION.

President	Place of Birth	Year	College
Washington ..	Virginia.	1752	None.
J. Adams	Quincy, Mass.	1735	Harvard.
Jefferson	Shadwell, Va.	1743	Wm. and Mary.
Madison	Port Conway, Va.	1751	Princeton.
Monroe	Virginia.	1758	Wm. and Mary.
J. Q. Adams.	Quincy, Mass.	1767	Harvard.
Jackson	North Carolina.*	1767	None.
Van Buren ..	Kinderhook, N. Y.	1782	None.
Harrison	Berkeley, Va.	1773	Hampden.
Tyler	Greenway, Va.	1790	Wm. and Mary.
Polk	North Carolina.	1795	U. of N. C.
Taylor	Virginia.	1784	None.
Fillmore	Summerhill, N. Y.	1800	None.
Pierce	Hillsbo', N. H.	1804	Bowdoin.
Buchanan ...	Cove Gap, Pa.	1791	Dickinson.
Lincoln	Kentucky.	1809	None.
Johnson	Raleigh, N. C.	1808	None.
Grant	Pt. Pleasant, O.	1822	West Point.
Hayes.....	Delaware, O.	1822	Kenyon.
Garfield	Orange, O.	1831	Williams.
Arthur	Fairfield, Vt.	1830	Union.
Cleveland ...	North Bend, O.	1837	None.
Harrison	Caldwell, N. J.	1833	Miami Univ.
McKinley ...	Niles, O.	1843	None.
Roosevelt	New York, N. Y.	1858	Harvard.

* It has generally been stated that President Jackson was a native of South Carolina, but the most authentic evidence that could be collected by Parton, the historian, and Kendall, his biographer, shows that he was born in Union County, N. C., about a quarter of a mile from the South Carolina line.

NO. 2. VOCATION AND SERVICE.

President	Vocation	Inaugurated	Service—Years
Washington ..	Planter.	1789	7 y. 10 m. 4 d.
J. Adams....	Lawyer.	1797	4
Jefferson	Lawyer.	1801	8
Madison	Lawyer.	1809	8
Monroe	Statesman.	1817	8
J. Q. Adams.	Lawyer.	1825	4
Jackson	Lawyer.	1829	8
Van Buren ..	Lawyer.	1837	4
Harrison	Farmer.	1841	1 m.
Tyler	Lawyer.	1841	3 y. 11 m.
Polk	Lawyer.	1845	4
Taylor	Soldier.	1849	1 y. 4 m. 5 d.
Fillmore	Lawyer.	1850	2 y. 7 m. 26 d.
Pierce	Lawyer.	1853	4
Buchanan ...	Lawyer.	1857	4
Lincoln	Lawyer.	1861	4 y. 1 m. 11 d.
Johnson	Statesman.	1865	3 y. 10 m. 20 d.
Grant	Soldier.	1869	8
Hayes	Lawyer.	1877	4
Garfield	Lawyer.	1881	6½ m.
Arthur	Lawyer.	1881	3 y. 5½ m.
Cleveland ...	Lawyer.	1885	8
Harrison	Lawyer.	1889	4
McKinley ...	Lawyer.	1897	4 y. 5 m. 7 d.
Roosevelt	Statesman.	1901	

NO. 3. DEATH AND BURIAL.

Presidents	Year	Cause	Place of Burial
Washington ..	1799	Pneumonia	Mt. Vernon, Va.
J. Adams	1826	Debility.	Quincy, Mass.
Jefferson	1826	Diarrhœa.	Monticello, Va.
Madison	1836	Debility.	Montpelier, Va.
Monroe	1831	Debility.	Richmond, Va.
J. Q. Adams..	1848	Paralysis.	Quincy, Mass.
Jackson	1845	Consumption.	Nashville, Tenn.
Van Buren...	1862	Asthma.	Kinderhook, N. Y.
Harrison	1841	Pleurisy.	North Bend, O.
Tyler	1862	Billious fever.	Richmond, Va.
Polk	1849	Diarrhœa.	Nashville, Tenn.
Taylor	1850	Bilious fever.	Springfield, Ky.
Fillmore	1874	Debility.	Buffalo, N. Y.
Pierce	1869	Stomach inflam.	Concord, N. H.
Buchanan ...	1868	Rheumatic gout.	Lancaster, Pa.
Lincoln	1865	Assassination.	Springfield, Ill.
Johnson	1870	Paralysis.	Greenville, Tenn.
Grant	1885	Cancer.	New York, N. Y.
Hayes	1893	Paralysis of heart.	Fremont, O
Garfield	1881	Assassination.	Cleveland, O.
Arthur	1886	Bright's disease.	Albany, N. Y.
Harrison	1901	Pneumonia.	Indianapolis, Ind.
McKinley ...	1901	Assassination.	Canton, O.

United States Sanitary Commission, The. An organization appointed by the United States government during the Civil War, and co-operating with it in promoting the health, comfort, and efficiency of the armies. It also gave aid to the navy. The war prevailed from 12 April 1861 to 9 April 1865. On 15 April 1861 President Lincoln called for 75,000 volunteers, believing they would be required for only a few months. But in July of the same year 800,000 more were called for, later 300,000, and in 1864, 500,000. Of this army of over 1,000,000 men (with 15,000 regulars) 350,000 died during the war, thousands were crippled by wounds and ailments. About 190,000 of the deaths were from sickness, mainly scurvy, dysentery, diarrhœa, erysipelas, and general debility, the result of insufficient sleep, clothing and food, exposure, hard marches, and poor drinking water. In the early part of the war, before drafting was resorted to, one eighth of the volunteers were in their 19th year, and three fourths were under 30 years of age. At the outbreak of the war, the Quartermaster, Commissary and Medical Departments of the regular army were inexperienced in caring for large bodies of men, in active service, the last war (Mexican) being in 1846–8. The medical staff could not properly initiate or execute sanitary work, as by custom hospital construction and the transportation of sick and wounded belong to the quartermaster department, and the regulation of diet to the commissary. Inspection and the means for giving aid were imperfect. The government had not learned the lesson of the Crimean war, that "the cause of humanity was identified with the strength of armies." In May and June 1861 many of the volunteers arrived in Washington, in miserable physical condition, in overcrowded cars, suffering from poor food, insufficient clothing and drinking-water. The people of the North were aroused as to the importance of adequate preventive and relief measures. The same day that the President called for 75,000 soldiers, the women and men of Bridgeport and Charleston, and on 19 April in Cleveland, and later in the month in New York, established soldiers' aid societies. During the war there were more than 7,000 such societies scattered throughout the North, tributary to the commission. Some of them, at first, proposed not only

to furnish nurses, clothing and comforts, but also delicacies, and to bring disabled soldiers home, to keep complete records of the sick and wounded, etc.

Realizing that some of these aims were impracticable, that to do the most good there must be co-operation in a definite plan, under the auspices of the government, Rev. Dr. Bellows and Dr. Elisha Harris called a public meeting at Cooper Institute. At this meeting it was decided "to collect and disseminate information upon the actual and prospective wants of the army, to establish recognized relations with the medical staff and act as auxiliary to it, to maintain a central depot of stores and open a bureau for the examination and registration of nurses." In this way, it was believed, results could be accomplished, similar to those effected by Miss Nightingale and the English Government Sanitary Commission in the Crimean war.

Drs. Van Beuren and Harsen, representing two prominent New York medical associations, suggested to General Scott that diseased men and mere boys should be discharged from the army. Comparatively few were discharged. The surgeon-general was asked to reorganize the medical staff and if possible have its sanitary powers increased. This was not done. In May 1861, the government was appealed to, to appoint a commission of civilians, medical men and army officers, to cooperate with the Medical Bureau (or to act independently of it) in an investigation as to preventable diseases of hospitals and camps. To this there was much opposition, even the President believing that such a commission would be "the fifth wheel to the coach." But on 9 June 1861 the government appointed "a commission of inquiry and advice in respect of the sanitary condition of the United States forces," consisting of Rev. Dr. Bellows, Prof. Bache, Drs. Wyman, Gibbs, Van Beuren, and Howe, from civil life, and Drs. Wood, Cullum, and Shivers, U. S. A., with power to add to their number. Dr. Wyman resigned, and Drs. Harris, Agnew and Newberry and Mr. Geo. T. Strong were added. The commission was to serve without pay, but had a furnished room allotted it in Washington, and was "to ascertain the sanitary condition of volunteers, to suggest means to preserve and restore health, and to insure the general comfort and efficiency of troops, such as proper cooks, nurses, hospitals, etc., and to correspond freely with the War Department and the Medical Bureau."

The United States Sanitary Commission organized 12 June 1861, with Rev. Dr. Bellows as president. Relief was to be subordinate to prevention and advice, the conclusions of the commission must "be approved by the Medical Bureau, ordered by the War Department and carried out by officers and men." Mr. Olmsted was appointed resident secretary and general manager at Washington. He had general oversight of the work of the commission, was in the confidence of the government, and ready at all times to supplement government deficiencies. Resigning his herculean task in 1863 he was succeeded by Dr. Jenkins and Mr. Blatchford. The six inspectors of camps appointed, found inefficient drains and police duty, overcrowded tents, offensive sinks, personal uncleanliness, poor and filthy clothing, badly cooked food and a scarcity of green vegetables. By persistent efforts of the commission, these deficiencies were gradually remedied to a large extent. But it was difficult at first to raise sufficient money for preventive measures, though life insurance companies responded nobly. Later, when the work broadened, railroad, telegraph and express companies gave their services and with the people at large contributed abundantly. Cash receipts to 1 May 1866, were $4,962,014.26, and of branch treasuries nearly two millions more. Over one fifth of this amount came from the Pacific coast — $100,000 received from California in one sum in 1862, saved the commission at a critical time. So great was the popular enthusiasm, that a sack of flour, first sold in Nevada to the highest bidder for $5,000, finally yielded in the western country, $40,000. Supplies were needed as the operations of the armies extended. Depots were established in New York, Boston, Philadelphia, Washington, and other cities, and calls were made upon the aid societies. Supplies furnished during the war were valued at $15,000,000. The women's convention at Washington in November '62, resolved to send supplies, "abundantly, persistently and methodically." Frequently the government asked the commission for blankets, green vegetables, etc.

After the battle of Murfreesboro and at Vicksburg and other points, scurvy broke out among the troops. The government could not obtain potatoes, but the commission, through its "potato and onion circulars" to farmers, forwarded to the armies an immense quantity of potatoes and green vegetables, and saved many lives. It established vegetable gardens at Nashville, Knoxville, Newbern and Chattanooga, worked by contrabands and convalescents. Potatoes, lettuce, radishes, onions, beans, spinach, cucumbers, squashes, okra, cabbages, corn, melons, pumpkins, etc., were raised. The money value of truck raised at Chattanooga from 15 April to 14 Nov. 1864, was $66,375.14. Ice was frequently furnished. When yellow fever prevailed at Newbern, in the town and garrison, the commission aided materially in the cleaning up.

Before the war there was no general hospital, only tent hospitals, the largest containing 40 beds. In July 1861 the commission suggested well equipped general hospitals in pavilion form, and that these should be built under the direction of the Medical Department, which should also arrange for the transportation of the sick and wounded and attend to their diet. These suggestions were carried out when Dr. Hammond became surgeon-general in April 1862. After the battle of Fort Donelson in February 1862, the government could not transport the sick and wounded to hospitals on the Ohio River. The commission did, in transports fitted up for that purpose. The same was true in the Peninsula campaign. It also operated during the war more than 30 ambulance cars, carrying to the hospitals in the East about 100,000 men, to the West, 125,000, the railroads conveying the cars free. The Camden & Amboy donated a car. The relief system was divided into general and special relief, the first attending to the wants of the inmates of general, field and regimental hospitals, and of men in camp and on the march, the second cared for the sick and needy at military depots, discharged men, paroled prisoners and irregulars. The various agents of the commission were paid a moderate salary, it being found best not to rely upon

volunteer agents. With each army was a medical inspector, relief agents, wagons and horses, transports if necessary and a supply depot at the base. The battle of Antietam was the first great battle when the organization of the commission told. There were 10,000 of our wounded, besides many of the enemy. Chloroform, opiates, and medical stores were supplied. Within a week there were distributed "28,768 shirts, towels, bed ticks, etc., 30,000 pounds of bandages and lint; 3,188 pounds of farina, 2,620 pounds of condensed milk, 5,000 pounds of beef stock and canned meats, 3,000 bottles of wines and cordials, and several tons of lemons, fruit, crackers, tea, sugar, rubber cloth, tin cups and hospital conveniences."

The special relief service, organized by F. W. Knapp, cared for men on their way to and from the front, in 40 "Homes," "Rests" and "Lodges" at various points; acted as attorneys in obtaining back pay and pensions, kept the inmates under surveillance that no danger might befall them; paid their way home when necessary, established feeding stations, where hot soup and coffee were always ready, and cared for discharged prisoners at parole camps, and the motley crowd of substitutes, stragglers, deserters, etc., at convalescent camps, affording comforts, information and opportunities to communicate with their families. The Auxiliary Relief Corps, organized by F. B. Fay in 1864, cared for the wounded and sick sent to the depot field hospitals in the rear of large armies, and also for those left behind by an army in its onward march. It furnished food, stimulants, underclothing and reading matter, communicated with the soldiers' friends, obtained express packages, and provided in many instances Christian burial. After the battle of the Wilderness, it followed the base of the army to Port Royal, White House and City Point, established special diet kitchens and attended to the sick and wounded. Other work was accomplished by the commission. Medical tracts, on subjects relating to army life, prepared by experts, were distributed to army surgeons. A Hospital Directory (main office in Washington, branches in other cities) was established, recording entrances, transfers and dismissals. In 1863, a "free pension and war claim agency" was founded. Over $2,500,000 of back pay and pensions amounting to $7,500,000 were obtained for discharged soldiers, at a saving to the beneficiaries of thousands of dollars.

Valuable statistics were published in pamphlet form, embracing the effects on soldiers of marches, the rate of recruiting required for the losses of war, measurements of soldiers, the number of sick in various regiments and the causes of sickness, etc. Nurses and physicians were supplied in emergencies. The success of the commission was due to the influence of popular ideas, American civilization and thorough organization. It had much to contend with, governmental red tape and deficiencies and the bad will of State agencies.

JEROME WALKER, M.D.,
Formerly Relief Agent, U. S. Sanitary Commission.

United States, Sculptors of. In studying the history of American sculptors it is necessary to distinguish between three periods. The initial stage of the art was from 1750 to 1850; this was succeeded by a period ending in 1876, from which time we may date our contemporary sculpture. The first period was of course a time of struggle against influences of various kinds, counting among them puritanic repugnance to anything like representation of the nude form. The second period included the stormy years of the Civil War, which was largely a time of commercial activity. And yet there were men toiling at that time whose genius and industry made possible the achievements of later years.

It is impossible in this present article to do more than mention the names of the artists who have made the American School of Sculpture what it is. The first sculptor of importance in America was a woman, Mrs. Patience Wright (1725–85) of Bordentown, N. J., who, according to common reputation, excelled in wax figures. A contemporary critic said of her, "her likenesses of the King, Queen, Lords Chatham and Temple, Messrs. Barre, Wilkes and others attracted universal admiration. Her natural abilities are surpassing, and had a liberal and extensive education been added to her innate qualities, she would have been a prodigy." Her likeness of Lord Chatham was a full length portrait in wax, which stood for many years protected by a glass case in Westminster Abbey.

The real commencement of American sculpture may be dated from the visit in 1785 of Jean Antoine Houdon, whose business was to make a portait statue of Washington, which work was cut in marble in France and sent to America in 1788. The commission was from the State of Virginia, and the statue is now in the state house at Richmond. There is also in Richmond a bust of Lafayette by Houdon; for this artist, the friend of the French Revolutionary patriots, was eagerly accepted by the people of the United States. There were also busts of Washington and other American statesmen by Giuseppe Cerracchi.

William Rush (1756–1833) of Philadelphia, was occupied as a carver of figure-heads for ships and developed a marked sculpturesque power. It appears that his work was limited to wood-carving, but his statues wrought in that material were often of life size and larger, and those that have been preserved, such as the one in Independence Hall, Philadelphia, have much merit.

The curious record of Hezekiah Augur's life is quoted by Mr. Taft (see his book in bibliography) from French's 'Arts and Artists of Connecticut'; and the two figures in marble preserved in the Yale Art School are the sole records of this career of disappointment and suppressed ability. John Frazee (1790–1852) was a native American who, as it seems, never left the United States. He took his mission as a sculptor very seriously, and was the pride of his contemporaries as the maker of the first marble portrait busts executed in America. These portrait busts were his most important work and they have unquestioned merit.

The first American deliberately to choose sculpture for a profession and to go abroad for the purpose of studying it was Horatio Greenough. He was born in 1805 and early exhibited a taste for art. He began modeling in clay under Solomon Willard of Boston, and took lessons in carving marble from Alpheus Cary.

In 1825 he went to Rome, where he began his art career by modeling a statue of Abel. Returning to America he executed portrait busts of President John Quincy Adams and Chief Justice Marshall. In the Boston Museum is his bust of Napoleon. His most notable work, however, is his half nude figure of Washington, over which he toiled for eight years. This important seated statue stands on the eastern side of the Capitol at Washington. It is treated as were treated the half mythological figures of Roman emperors, such as are to be seen in the galleries of the Vatican at Rome. Those statues put on somewhat the air of the deified emperor; and in like manner it has been alleged that the classically treated figure of the first President holding a Roman sword in the left hand, pointing with the right hand to heaven, and seated upon a marble chair of Roman design, is in a way a Zeus or Jupiter, as much as a portrait statue.

Hiram Powers was born in the same year with Greenough and began his artistic life as a modeler in wax for a museum. He afterward moved to Washington, where he was very successful in portrait busts. He subsequently (1837) sailed for Italy, where he continued to live until his death in 1873. His greatest work is 'The Greek Slave,' in which is represented a woman as if taken by the Turks from one of the Islands of the Archipelago, standing stripped and manacled in the market-place. Many copies of this statue were executed by the artist, but only one is now accessible to the public, and that stands in the Corcoran Gallery at Washington. None of the nudes of Powers can be ranked as first-class sculpture, but his execution is smooth and careful. His figures are tolerably well modeled, but there is little life, spirit nor meaning in them. But Powers, like Greenough, was a real and sincere pioneer in American art; and from this mediocrity was to spring eventually the fresh originality of a maturer day.

The most important sculptor of the early time was Thomas Crawford (1813–67) who, dying young, left behind him much work of unquestioned importance. His most significant work of sculpture is the pediment of the southern wing of the Capitol at Washington, in which, although the space is not sufficiently filled and the figures are too small, slender and light for the architectural framing, there is yet real significance in a kind of emblematic history of American development. The colossal 'Freedom' which crowns the dome is the best known of his works and it just misses sublimity. Probably his most valuable work is to be found in the bronze doors of the Capitol which, though in a way they have been surpassed by the Rogers doors mentioned below, are still vigorous compositions. Probably the best known of his works is the bronze statue of Beethoven in Boston.

The statue of Henry Clay at Richmond is the work of Joel T. Hart of Kentucky, and was completed in 1859, after engaging the labor of the sculptor for 13 years. Shobal Vail Clevenger, another early sculptor, died at the age of 31 in 1843. He is known for his excellent bust of Henry Clay in the Metropolitan Museum of New York. His portrait busts are remarkable for their exactitude and truthfulness and he certainly exhibits a grasp of mind and a comprehensiveness of knowledge hitherto unprecedented in American art. Joseph Mozier was born in Vermont 1812. He sailed for Europe in 1845 and worked at Rome until his death in 1870. His 'Rizpah,' now in the Metropolitan Museum, was executed in 1869 and is perhaps the most inane of all the works in that collection. His most important work is 'The Prodigal Son,' the treatment of which, however, is extremely hard and conventional. Ball Hughes, of English birth, settled in New England where he died in 1868. He was known for the marble portrait statue of Alexander Hamilton in New York, destroyed afterward in the great fire of 1835. Chauncey B. Ives (1812) left behind him several statues and groups of some interest — popular in their character but not without a certain easy merit.

American sculpture saw its first great advance in the work of Henry Kirke Brown, whose statue of Washington in Union Square in New York must be looked upon as a first-rate production. However American art may be developed, the time will never come when this excellent equestrian statue will be considered anything but good sculpture. This is much the most important of Brown's works in sculpture, but there is also by him an admirable statue of the Revolutionary Gen. Greene in the collection of the Capitol at Washington, in which collection there are also three other portrait statues by him; and the Winfield Scott, an equestrian statue in the Scott Circle at Washington, is of singularly good taste and severity of treatment, the horse standing on all four feet as if using all his strength to support the colossal figure of the late lieutenant-general after Washington. In this respect the two equestrian statues by Brown contrast most favorably with the childish treatment of the Jackson monument by Clark Mills. This statue, also in Washington, caused great excitement at the time of its erection because the heavy casting is balanced upon the hind feet, a trick utilized also in one of the statues of Peter the Great in Russia. The statue has little merit, even of technical skill in modeling.

With the works of Erastus D. Palmer and Thomas Ball, American sculpture made great advances. Palmer's 'White Captive' in the Metropolitan Museum is a charming creation, a figure of virginal grace and softness, while Ball's equestrian statue of Washington in Boston is certainly, for life, action and dignity, one of the first of its kind in the country.

William Henry Rinehart (1825–74) attracted little attention during his life, but his posthumous reputation is great; and a peculiar honor has been done him in the organization of a collection of his works at the Peabody Institute in Baltimore. There are also works of his in other American museums. The best of these works lack general interest; and it is doubtful if they will ever receive as much study as they deserve except from those few sculptors who are concerned with the past history of their own art.

The earliest American sculptor to win a European reputation was William Wetmore Story, born in Massachusetts 1819. His 'Cleopatra,' now in the Metropolitan Museum, New York, was exhibited in London 1862. It has been a much discussed work of art, eulogized by Hawthorne and condemned by cooler critics.

Like all the works of this sculptor it shows fancy and skill of invention, but has nothing in it that can properly be classed as genius. His exceptional repute came of his long residence in Rome and his literary gifts. Randolph Rogers was born in 1825. He studied sculpture at Rome under Bartolini and was a prolific worker. His productions, however, are without poetry and almost without marked expression. His statue of Seward in Madison Square in New York is on the whole a good piece of work, though marred by the curious error which makes it seem the statue of a very tall man; his Lincoln in Philadelphia has no such deterrent quality. The most notable productions of Randolph Rogers are the eastern doors of the Capitol at Washington, with reliefs of the life of Columbus. Another sculptor of the period is John Rogers, known for his small groups.

Among woman sculptors are Harriet Hosmer, the classicist, whose dignified 'Zenobia' is in the Metropolitan Museum. Equally memorable were Emma Stebbins, Margaret Foley, Edmonia Lewis, Vinnie Rean, Blanche Nevin, Elizabeth Ney, and especially Anne Whitney, the author of some meritorious portrait statues.

During the 15 years following the Civil War there came into existence a new school of sculpture in the United States, earliest among whom was John Quincy Adams Ward, a pupil of H. K. Brown. His bronze 'Indian Hunter' is one of the finest statues in Central Park, New York; while his statue of Henry Ward Beecher in Brooklyn and his remarkable 'Pilgrim' in Central Park are notable and epoch-making productions. Still more remarkable are the attendant figures grouped about the pedestal of the Beecher statue. Portrait statues, sometimes partly idealized, have been, however, the most often successful in American sculpture, and Ward's work has been no exception to this rule. His 'Washington' on the steps of the Sub-Treasury in Wall Street, New York, his most interesting 'Lafayette' in the university grounds at Burlington Vt., and the remarkable seated statue of Horace Greeley in front of the *Tribune* office, are artistical successes of a high order. It is rare that portrait sculpture is made so truly sculpturesque. The equestrian statue of Gen. George Henry Thomas at Washington, D. C., is one of the most successful works of the sort, the horse standing quiet except as his attention is called by tumults as of passing soldiery, and the pose of the man perfectly understood. The celebrated naval arch erected in New York after the war with Spain was crowned by a remarkable work by Ward, a group made up of the principal figure studied rather closely from the magnificent 'Victory of Samothrace,' and sea-horses supposed to be drawing her chariot. It was most unfortunate that this could not be preserved in its place or in a similar situation. The crowning glory of Ward's career will be the great pediment of the Stock Exchange building in New York, which now (June 1904) is approaching completion and which has been known for a year or more in the model.

As the Civil War gave a great impetus to the building of public memorials and the erection of statues, so the period of its close was marked by the appearance of such artists as Thompson, Meade, Bissell, Simmons and Milmore. Launt Thompson's 'Napoleon' in the Metropolitan Museum is a fine specimen of dignified monumental art. Larkin G. Meade was a pupil of Henry Kirke Brown, and one of his greatest works is the statue of Lincoln and that of Ethan Allen at Washington. George Bissell has made his mark in New York by his 'Lycurgus' on the Appellate Court Building and his 'President Arthur' in Madison Square. Franklin Simmons is the author of the 'Roger Williams' in the Capitol, Providence, R. I., and the monument of General Logan at Washington.

The influence of the French school in modern American sculpture is seen most strikingly in the work of Augustus Saint-Gaudens, one of the greatest figures in modern sculpture on this side of the water. For originality, freshness, vigor and imaginative energy there is nothing among American sculpture that can excel the 'Shaw Memorial' in Boston Common or the equestrian statue of General T. W. Sherman in New York. Daniel Chester French was born in 1850 and his equestrian statues of General Grant (1899), Washington (1900), and General Joseph Hooker (1903) are all good sculpture, whose workmanship satisfies the artist while it appeals to the popular taste. Mr. French's most remarkable achievements are, however, in the way of a singularly profound and delicate sentiment rendered in sculpture of high technical merit; thus the Milmore tomb at Mt. Auburn Cemetery, Massachusetts, has the alto-relief, death stopping the sculptor's hand; the group of Gallaudet teaching a deaf and dumb scholar is full of pathos; the monument in the Boston Fenway to the memory of John Boyle O'Reilly consists of three symbolical statues admirably grouped on a granite monument of ancient Irish decoration. Frederick MacMonnies is one of the boldest, the most dashing and brilliantly successful of modern sculptors. His 'Nathan Hale' in City Hall Park and his 'Bacchante' in the Metropolitan Museum show the great range of this sculptor's genius. Another brilliant sculptor of the day is George Grey Barnard whose 'Two Natures' is one of the most original productions of the modern chisel.

Paul Wayland Bartlett (1865) has won fame by his 'Columbus' at Washington and still more by the magnificent 'Michelangelo'; both of these being in the rotunda of the Library of Congress, as Charles Niehaus has by his 'Garfield' at Cincinnati, and the figure of the 'Driller.'

The modern school of American sculptors includes Boyle, Elwell, Comper, Tribel, Ruckstuhl, Moynihan, Doyle, MacNeil, Lukeman, Conti, Proctor and Potter. These are all original and characteristic workers whose productions are of high promise for American art. One of the most interesting developments has been in the field of pure architectural sculpture, in such work as that of John Evans in the porch of Trinity Church in Boston. The very latest great achievement is also of architectural character: for the new front of St. Bartholomew's Church in New York, finished in 1903, includes important bronze doors and marble reliefs by Herbert Adams of Brooklyn, Philip Martiny, and Andrew O'Conner, who worked in aid of D. C. French on the middle doorway.

Revised by Russell Sturgis.

United States Steel Corporation. See Steel and Steel Manufacturing.

United States, The Wars of the. As generally regarded, the United States is rated as one of the most peaceable nations in the world, the idea being that during the 130 years of its existence it has participated in but five wars, in all of which, parenthetically, it has been victorious. Notwithstanding the general credence given to this statement, it is far from being in accord with history, for, as a matter of fact, scarcely a year has passed in which either the army or the navy has not been called upon to do battle for the country. Of late, it is true, the unpleasantness in the Philippines has been the only discordant element, but, prior to that, there were the labor disturbances; the Indian wars and massacres, and a dozen other factors that kept the United States forces almost constantly engaged in warfare of a more or less consequential character. At times, of course, some of the disturbances were little more than riots, but there were other events which seem to have been quite as thoroughly forgotten by the ordinary reader of history, but which in every respect deserve a place in the catalogue of wars. In fact the War of the Revolution had scarcely commenced when the colonists were compelled to meet the attacks of the Indians who, inspired by the English, instituted an incessant border warfare against the whites; a warfare of brutality which culminated in the bloody massacres in Wyoming Valley, Pa., and Clinton, N. Y.

The Shays Rebellion.—The first armed and organized rebellion against the conduct of political affairs in the United States, however, occurred in Massachusetts in 1786, when Daniel Shays organized the dissatisfied faction in the community into an armed and determined force of malcontents. The cause of this early trouble was largely a financial one. Solid money was still scarce, with paper money practically worthless, and yet affairs were at such a state that debts contracted upon a paper basis were pressed for payment in solid money. As this was a period when men were imprisoned for debt, such conditions were held to be almost usurious in their effect, and the orderly meetings of protest which were at first held soon developed into violent assemblages. In August the tide of dissatisfaction had become so strong that uprisings occurred in many parts of the State; courthouses were seized and courts were prevented from sitting; the governor announced his determination to put down the rebellion, and there were several engagements between the insurgents and the volunteer forces of the State. At last, in February 1787, General Lincoln surprised the rebels at Petersham, where, after a decisive engagement, they were dispersed.

The Whiskey Rebellion.—The announcement that the Federal Government had assumed the right to levy an excise tax was the cause of the insurrection in Pennsylvania which is now commonly referred to as the "Whiskey Rebellion." The act, which was passed in May 1792, was strenuously opposed on political grounds, the argument against it being that it was dangerous to the doctrine of individual liberty. In the four western counties of Pennsylvania whiskey was a staple product, and, aside from its political aspect, the people felt that such a tax was an unjust discrimination against that region. The attempts to enforce the law were resisted with violence, therefore, and all citizens who advocated conformity to the law, or who quietly conformed to it were subjected to various kinds of ill-treatment by their neighbors. To further inflame the spirit of opposition incendiary posters, all signed "Tom the Tinker," were displayed in all directions, and there was rioting and bloodshed in many places. In this emergency President Adams assumed control of the situation, and sent 13,000 troops upon Parkinson's Ferry in time to receive the peace overtures of the rebels. They were not accepted, however, and many arrests were made.

War with France.—One of the first troubles with which President Adams had to contend was the French question, for it had then become plain to all that America would have to take some decided steps if she was to maintain her honor against the arrogance of France. The President's policy of neutrality, following on Jay's treaty with England, had greatly exasperated France, and when the American envoys were ordered out of that country it became apparent that war could not be far off. In fact French and American vessels did meet on the ocean, but in the encounters that followed, thanks to Captain Truxton and his frigate Constellation, the United States did not make a discreditable appearance. In the battle with the French frigate L'Insurgente, off the island of Nevis in the fall of 1799, as well as in her encounter with the frigate La Vengeance, off Guadaloupe, in February 1800, the Constellation was victorious. Realizing that war was already under way upon the water, the United States government began to prepare her land forces. General Washington was again summoned from his retirement at Mount Vernon to assume command of the army, but as the formal declaration of war was deferred, Napoleon's seizure of the governmental power in France gave a new aspect to the situation, and a treaty of amity was soon concluded between the two countries. See UNITED STATES—THE WAR WITH FRANCE.

The Fries Rebellion.—What is known in the history of Pennsylvania as "Fries' Rebellion," or the "Window Tax War," was the result of an act of Congress, which, in July 1798, levied a direct tax of $2,000,000, of which the sum of $237,000 was apportioned as Pennsylvania's quota. In this State the tax was appraised upon houses and land, the amount assessed against each house being determined by the size and number of its windows. In some portions of the State the tax was accepted practically without protest, but the German residents of Montgomery, Lehigh, Bucks, and Berks counties organized opposition to it under the leadership of John Fries. It was not long before there was open conflict between the rebels and the United States authorities, one of the acts of the insurgents being an attack upon the marshal at Bethlehem, where that official was compelled by force of arms to liberate 30 persons whom he had arrested for their opposition to the window tax. Under the circumstances an appeal was made to President Adams, and the militia was ordered to suppress the rebellion, which ended with the capture of Fries and a number of his adherents. Taken to Philadelphia, Fries was twice tried for treason, and, being convicted, was sentenced to death. In 1800 he was pardoned by the President.

The Barbary War.—It was not long after the signing of the treaty of peace with England that the Barbary powers commenced to annoy Amer-

ican commerce. In 1784 the Betsey was captured; in 1785 the Maria of Boston and the Dauphin of Philadelphia were seized and their crews held as captives with threats of ultimate slavery if the ransom, amounting to some $60,000, was not paid. As ransom was regarded as cheaper than force, various large sums were contributed at the command of the Dey of Algiers. To Thomas Jefferson, however, such abject submission to a barbarous ruler was particularly loathsome, and he decided to put an end to such outrages. Commodore Dale was, therefore, ordered to the Mediterranean, where one of his vessels, the Experiment, soon captured a Tripolitan cruiser of 14 guns, and, by 1803, war was on in earnest, culminating, on 27 April, in the bombardment of Tripoli.

Slave Insurrection, Louisiana.— In January 1811 there was an uprising of slaves which extended throughout the entire parish of Saint John, La. The whites armed themselves and there were several serious battles between the two forces, more than 60 of the negroes having been killed before the slaves could be forced to surrender.

War of 1812.—The bloodless Burr conspiracy; the Sabine expedition; the unwarranted attack upon the Chesapeake by the Leopard, a British two-decker; and the troubles resulting from the Lake Champlain embargo, all of which kept the United States forces engaged in more or less active service, were soon forgotten in the more important declaration of war with Great Britain (see UNITED STATES — WAR OF 1812), and this conflict had scarcely commenced before the troubles with the Indians began once more with the Seminole War in Florida. The growth of the country; the expansion of its territory; the explorations of venturesome spirits who were continually opening up new lands for settlement, all had a tendency to arouse sentiments of dissatisfaction in the minds of the red men. They saw that encroachments were constantly being made upon them; the fields of the white man interfered with their hunting and fishing; the industry and other features of civilization were distasteful to them, and, as original occupants of the land, one by one the various tribes began to enter their vigorous protests, protests which finally assumed warlike proportions. From the beginning of the War of 1812, therefore, almost up to the beginning of the 20th century, the soldiers of the United States have been engaged in battles with the Indians, and as these almost continuous disturbances and massacres have occurred first in one part of the country and then in another the present-day submission of the red man has not been obtained without the expenditure of much money and the cost of many lives. At about the same time, throughout the Southern States, a spirit of dissatisfaction was also being engendered; the dishonesty of the blacks, and the danger of slave insurrections making rights in property insecure. Of these insurrections there were several, but the only one that attained any great degree of importance was the Turner Rebellion which broke out in Virginia, in 1831.

Nat Turner's Rebellion.—Among the blacks in Virginia there was one who exerted a great influence over the slaves. His name was Nat Turner, and he firmly believed that he had been called of God to lead his people to freedom. He had heard voices calling to him from the air; he had seen strange signs in the sky, and all the portents which he could interpret gave additional proof of his divine commission. Forming an alliance with three other blacks and three ignorant white men, he began his crusade by killing several families. Wherever he went there was bloodshed, while everywhere he pressed the slaves into his service until he was accompanied by a force of more than 200 persons. Unable to suppress the insurrection, an appeal to the government was made, and both Virginia and North Carolina sent troops to the scene of the outrages. As the result, all the insurgents were either killed or captured; Turner and 16 of the leading spirits were hanged, and scores were punished, some most inhumanely and without trial, their bodies being decapitated and their heads impaled along the highways as a warning.

Troubles Under Jackson's Administration.— The political contest which shook the Union to its very centre in 1832, culminated, in all its violence, in the South Carolina doctrine of State Rights and Nullification. The origin of the trouble was the tariff: first, the tariff passed during the Adams administration, which was extremely distasteful to the South, and, second, the tariff of 1832, which was even more so, and as, at this time, there was a powerful party in South Carolina which contended that Congress had no power to impose taxes for the protection of home industries or manufactures, and who held that each State had the right to judge if Congress had exceeded its powers, and, if so, to disobey it, it was not long before the new act was declared unconstitutional. It was resolved, therefore, to prevent its enforcement in the port of Charleston, even by armed resistance, or by withdrawal from the Union. In fact, so strong was the feeling upon this subject that the nation was threatened with dissolution. President Jackson, however, refused to listen to the arguments of the nullifiers, the leaders among whom were Hayne and Calhoun, the latter having resigned the vice-presidency to accept a seat in the Senate in order that he might speak upon this question, and he at once ordered troops to Charleston. The presence of the soldiers had a quieting effect upon the belligerents, who postponed their threatened action, and the difficulty was finally settled by the Clay compromise bill. More trouble with the Indians and the "Toledo War," a dispute over the southern boundary between Ohio and Michigan, which followed the admission of the latter State to the Union, were among the factors that disturbed the Jackson administration, but none of these events were as important as the Mormon disturbances, and the "Patriot War," which occurred soon after Van Buren's succession to the Presidency.

Mormon Disturbances.—During the peregrinations of the Mormons, prior to their ultimate settlement in Utah, they attempted to locate in several places, but as their presence was not relished by other citizens, who charged them with such crimes as robbery, arson and secret assassination, they had frequent conflicts with mobs and were driven from spot to spot until they made their final stand in Missouri, at the town of Far West, in Caldwell County. Here they were joined, in 1838, by Joseph Smith and Sidney Rigdon, who, after the failure of the Mormon Bank at Kirtland, Ohio, had fled from

that State to avoid arrest for fraud. To the troubles arising from the hatred and distrust of the people of Missouri there were soon added those of internal dissensions. On 24 Oct. 1838 Thomas B. March, president of the 12 apostles, and Orson Hyde, one of the apostles, made affidavit that Smith and Rigdon placed the teachings of the Book of Mormon and the regulations of the Church above the laws of the land, and that there also existed among the Mormons a band known as the "Danites," organized to execute the will of the head of the Church, whether it were legally right or wrong. Under such conditions the feeling against the Mormons grew so strong that it was determined to drive them from the State. Smith and Rigdon had already been arrested on charges of treason, murder and forgery, but their adherents fortified their settlement and resisted both the popular will and the law so strenuously that it became necessary to call out the militia to expel them. They at once turned their steps towards Illinois, where they founded the city of Nauvoo, but the authorities were to have still more trouble with them, the most serious disturbances being those of 1844, when they were driven out of Illinois, and those which followed the Mountain Meadow Massacre, in 1857, when an army of 2,500 men, under Col. Albert Sidney Johnston, was sent to Utah to put down Mormon resistance to United States' authority.

Alton Riots, Illinois.— The Alton, Ill., riots resulted from a popular uprising against the Saint Louis 'Observer' and its owner, Rev. Elijah P. Lovejoy. Compelled to leave Saint Louis by reason of his anti-slavery proclivities, Mr. Lovejoy took his paper to Alton, Ill. There, too, he provoked enmity, however, and several riots occurred, his newspaper plant being destroyed no less than three times. On the occasion of the last riot, 7 Nov. 1837, Mr. Lovejoy was killed.

Patriot War.—Friendly relations with Great Britain were again endangered in 1837, when the so-called "Patriot War" broke out on the Canadian frontier. Sympathizing with the movement, the people of the United States did much to aid the insurgents, some New Yorkers even going so far as to seize an island in the Niagara River. These acts, however, received such prompt recognition from the government, which not only issued a neutrality proclamation, but sent Gen. Wool to the Niagara frontier to preserve the peace, that no ill effects resulted. Equally successful was Gen. Scott, who was sent to the northeast frontier to quiet the disturbances which had resulted from a dispute over the boundary line between Maine and New Brunswick.

Dorr Rebellion.—Although friendly relations were maintained with all foreign powers during Tyler's administration, several internal disturbances occurred which called for quick action upon the part of the authorities. In Rhode Island, for example, the Dorr Rebellion required the presence of the United States troops, while the militia was called upon in New York to suppress the anti-rent rioters. According to the judgment of later days Thomas W. Dorr, the political reformer who led Rhode Island into its only insurrection, was a man whose chief offense was that he was in advance of his time, for since his death every reform for which he argued and for which he was ready to fight has been freely adopted by the people of the State. According to the charter which had been granted to Rhode Island by Charles II., in 1663, no person was permitted to vote for town or State officials unless he was possessed of a certain amount of real estate. Under a subsequent statute of the legislature no person could be admitted a free man of any town, with such political privileges, unless he owned a freehold estate to the value of $134, or was the eldest son of such a freeman, qualifications which barred fully two thirds of all the citizens of the State from becoming legal voters. It was to these provisions that Dorr and his adherents objected, and when they found that they could not accomplish their purpose in any peaceable way, recourse was had to arms. The insurgent forces, however, were defeated and dispersed upon each occasion. Dorr, who was convicted of high treason, was subsequently pardoned.

Anti-Rent Rebellion.—During this time the New York authorities were engaged in trying to suppress the anti-rent rebellion. According to the statement of Willard, the historian: Under the early Dutch governors of New York certain settlers received patents of considerable tracts of land, that of Van Rensselaer being the most extensive, comprising, as it did, the greater portions of Rensselaer and Albany counties. These lands were divided into farms of from 100 to 160 acres, and leased in perpetuity on condition that the tenant pay annually, to the landlord or "patroon," a quantity of wheat from 22½ bushels to 10, in addition to four fat fowls, and a day's service with wagon and horse. If the tenant sold his lease, the landlord was entitled to one quarter of the purchase money. The summer of 1844 witnessed the most violent disturbances by the anti-rent party in the eastern towns of Rensselaer, and the Livingston Manor, in Columbia County. The anti-renters formed themselves into associations to resist the law, and armed and trained bands, disguised as Indians, scoured the country, crying "Down with the rent!" and in various ways intimidating those who favored the execution of the law. In 1846, Silas Wright was chosen governor of the State, and, by his wisdom and firmness, public order was restored. By proclamation, he declared the locality in which these disorders prevailed to be in a state of insurrection; resolute men were made sheriffs, military forces were brought into requisition, and the leading anti-renters were not only brought to trial but were convicted.

The Revolt in New Mexico.— The revolt against the authority of the United States government which broke out at Taos in 1847, was quickly suppressed by the Federal forces under the command of Col. Sterling Price. Montoya, the leader of the insurrection, who had assumed the role of governor, was captured, tried by court martial, and shot, 7 Feb. 1847.

Kansas Border Warfare.—Following the Mexican War (q.v.) the government was engaged in almost continuous conflicts with the Indians, while the "Know Nothing" disturbances, which followed the organization of the American party, and resulted in anti-foreign and anti-Catholic riots in various parts of the country, caused no little trouble. As the years passed, however, the anti-slavery question had pushed itself further and further to the front and it required no inspired prophet to predict

that a few such disgraceful incidents as those which accompanied the rendition of Anthony Burns in Boston would make the issue the vital one for the nation. In the meantime the Kansas border troubles, troubles which practically resulted in civil war, held the attention of the people. This sectional excitement arose from the introduction of a bill into Congress by Senator Douglas of Illinois, which provided for the organization of that vast tract lying west of Missouri, Iowa and Minnesota, into two territories, Kansas and Nebraska, each of which, being exempt from the operations of the Missouri Compromise, should come in as free or slave States according to the vote of the people at the time of their admission. Although this bill was fiercely fought in Congress, it was passed in 1854, upon which there began a terrible struggle for the possession of Kansas. From the Northwest and the East the anti-slavery men flocked into the territory, while the slavery partisans, with their slaves, rushed in from the South, each party being determined to people the new land with settlers in sympathy with their respective views. To make matters worse the Missourians — or so it was charged — crossed the borders by the hundreds, and, wherever it was possible, controlled the elections. As the result of the disruption two sets of territorial officers were elected, and civil war with all its attendant evils followed. During the summer of 1856 the territory was in constant war. Men were murdered and towns were sacked, and while both sides were guilty of violence, the free-state party was much the less so, being confessedly in the majority. For two years Kansas suffered, but at last the opponents of slavery gained the upper hand, and, in 1861, Kansas was admitted as a free State. Among the many anti-slavery leaders in Kansas none had been more prominent than John Brown (q.v.), a man of great courage, who believed that the liberation of the slaves could be easily accomplished if they should be given an opportunity to rise. With 21 men, therefore, Brown went to Virginia to carry out his purpose. They succeeded in seizing the United States arsenal at Harper's Ferry, but as neither the negroes nor the anti-slavery whites gave them the support for which they had hoped, they were soon overpowered by a force of marines. With the exception of two, who escaped, all the participants in the revolutionary movement were either killed during the engagement or hanged afterward, the latter being the fate of John Brown.

Fenian Troubles.— Shortly after the close of the Civil War (q.v.) in the United States, leaders in the long continued struggle for the emancipation of Ireland undertook to make this country the base of operations against England by the invasion of her Canadian possessions. There was an organization of formidable numerical strength, largely composed of a military body known as the "Fenian Brotherhood." During the excitement large sums of money were raised, bodies of soldiers were organized and drilled, and war material was gathered together at convenient points. The first actual attempt at invasion was made in April 1866, when an iron steamship was purchased in New York and manned to carry arms and munitions of war to Eastport, Maine, from whence a descent was to be made upon the island of Campobello, belonging to New Brunswick, and the breakwater between Eastport harbor and the Bay of Fundy. Pending the arrival of the steamer some 500 Fenians had gathered at Eastport, but the boat did not sail, the order for her departure having been countermanded by the leaders of the movement in New York. The intending invaders, however, remained at Eastport, to which point a schooner was despatched with 750 stand of arms sent from Portland, but on representations made by the British consul these were seized by the United States authorities, and while the Canadian troops were sent to the frontier from Saint John and a British warship was stationed outside the island of Campobello, there was also an American force on hand under command of Capt. Meade. Later, in May of the same year, the Fenians made a more pretentious demonstration, under the direction of Gen. Sweeney, but before anything was accomplished in the way of getting upon Canadian soil the United States authorities seized 1,000 stand of arms at Rouse's Point, N. Y. Several other seizures afterward occurred, and, in the meantime, the entire volunteer force of Canada was ordered out. On 1 June between 1,200 and 1,500 Fenians crossed the Niagara River at Buffalo in canal boats. They were under command of Capt. O'Neil, a graduate of West Point. A skirmish took place the following day, when it was reported that nine Canadians had been killed and a number wounded. At this time Gen. U. S. Grant was in command of the United States troops sent to the frontier and he not only prevented any reinforcement of the invaders, but arrested the entire Fenian army upon its return, placing all members of the party under parole to keep the international peace. On 7 June another expedition entered Canada, going from Saint Albans, Vt., and Malone, N. Y. This force numbered nearly 2,000 men. It advanced upon Saint Armand, which the Canadians had evacuated, but, on the 9th, the Canadian force returning, the Fenians were driven back, with a loss of 15 prisoners.

Walker's Expeditions.— The violation of the neutrality laws was always the excuse for the United States' interference with William Walker's various filibustering expeditions. In 1853 this famous American adventurer invaded Lower California, where, his plans failing, he surrendered to the United States authorities at San Diego. Having escaped conviction, two years later he invaded Nicaragua, where, for a time, he was successful. In 1857 he fell, however, and on 1 May he surrendered to Commodore Charles H. Davis of the United States sloop-of-war Mary. Taken to New Orleans, he not only escaped trial, but, evading the government authorities who were watching him, he organized another expedition and landed at Greytown on 14 Nov. 1857. Shortly after landing, however, he was again compelled to surrender to Commodore Paulding of the United States frigate Wabash. Although the United States authorities had no further trouble with Walker, his next expedition was a fatal one, for, having invaded and captured a part of Honduras, he was himself captured by the commander of the British man-of-war Icarus, by whom he was delivered to the Honduran officials, and was shot, 12 Oct. 1860.

The Draft Riots.— The necessity of reinforcing the Union army by means of conscription resulted in the development of a strong spirit of opposition to the Government, a senti-

ment which, in New York and Boston, culminated in uprisings that were suppressed with great difficulty. In New York city the outbreak occurred on 13 July 1863; in Boston, a day later, but while the Boston riot was suppressed by the militia within 24 hours and at the cost of only one life, in New York order was not restored until the 16th. During this period of disturbance property to the value of more than $2,000,000 was destroyed, and it was estimated that fully 1,000 of the rioters fell in the various battles between the troops and the people.

Tin Horn War.— The Ku-Klux (q.v.) disturbances in the South; the later and still fruitless Fenian demonstration on the Manitoba frontier; the insurrection against Gov. Kellogg in Louisiana; the race riots and massacres in several of the Southern States; the troubles arising from the opening of Oklahoma and the Cherokee Strip, and the Chinese labor riots in the West, were events which, like several of the labor uprisings of later days, have required the attention of United States troops or State militias for their suppression. Of more consequence, however, was the "Tin Horn War," the last affair of importance with which the United States had to deal prior to the War with Spain and the later insurrection of the Philippine Islanders. The "Tin Horn War" was in reality a series of outbreaks against the Mexican government, beginning in the autumn of 1891, and continuing intermittently into the early part of 1894. In each of these outbreaks the insurgents operated along the Rio Grande, and evidently relied upon the contiguity of the United States for safety in case of defeat. Catarino Garza, who had conducted a number of periodicals opposed to the administration of President Diaz, inaugurated the first of this series of troubles in September 1891. He was at that time living on his cattle ranch in Texas, near Palito Blanco, at which place he collected his band of revolutionists. Issuing a manifesto, in which he proclaimed the overthrow of Diaz, he crossed the Rio Grande with less than 100 men, who were reinforced from time to time by sympathizers in the movement. There were many brushes with the Mexican troops, and, little by little, the insurrectionary spirit extended. The fact that the insurgents took refuge on American soil when worsted made it necessary for the United States authorities to act, and two companies of infantry, with two of cavalry, did effective work in preventing the violation of American neutrality. The Mexican government sent a strong force to the scene of trouble and the fighting degenerated into guerrilla warfare. During the latter part of 1892 there was another gathering of insurgents, under leaders named Pacheco and Perez, the scene of operation being several hundred miles above that of Garza's war. The rebels captured Ascension and Corralitos, driving out the American settlers who crossed the Rio Grande into New Mexico. The Indians along the Yaqui River joined in this uprising, while another band of rebels, under the leadership of a man named Amalla, added to the complications. During this period Gen. McCook had maintained a force on the American side of the Rio Grande and it was largely through his efforts that, in 1893, the insurgents were dispersed. The last outbreak occurred in January 1894, when two filibusters named Ochoa and Lugan attempted to revive the insurrection. They were unsuccessful, however, being dispersed after two somewhat sharp engagements.

The Colorado War.— Disturbances resembling in intensity and bitterness the Pullman Car Company strike and the mining troubles at Cœur d'Alène, Idaho, occurred during the winter and spring of 1903–4 in the Cripple Creek mining district, Colorado. In the summer of 1903 a strike was ordered and several thousand miners went out. Three weeks after the inauguration of the strike, an assault on two miners resulted in the ordering of State militia to the region. The presence of the soldiers was resented and rioting followed. Martial law was declared, "bull pens" established, and the leaders of the strikers arrested on various charges. Later on, prominent strikers were deported by order of the military. A state of almost civil war existed, which increased as the spring advanced. In June a crowded station was blown up by dynamite and 12 men killed. More rioting followed, and several battles occurred between strike sympathizers and the militia.

The following is a practically complete list of the wars and minor engagements, or disturbances, in which the United States has participated since 1775:

1775–1783	War of the Revolution, 19 April 1775 to 11 April 1783.
1782–1787	Wyoming Valley Massacres, Pennsylvania.
1786–1787	Shays Rebellion, Massachusetts.
1790–1795	War with Northwest Indians.
1792–1794	Whiskey Insurrection, Pennsylvania.
1798–1800	War with France.
1799	Fries' Insurrection, Pennsylvania.
1801–1803	War with Tripoli.
1806	Burr Conspiracy.
	Sabine Expedition, Louisiana.
1807	Chesapeake Bay naval battle.
1808–1809	Lake Champlain embargo.
1811–1813	War with Northwest Indians.
1811	Slave Insurrection, Louisiana.
1812–1815	War with Great Britain.
1812	Seminole War, Florida.
1813	Peoria Indian War, Illinois.
1813–1814	Creek Indian War, Alabama.
1817–1818	Seminole War, Florida.
1819	Yellowstone Expedition.
1823	Upper Missouri River campaign against Blackfeet and other Indian tribes.
1827	La Fevre Indian War, Wisconsin.
1831	Turner's Rebellion, Virginia.
	Sac and Fox troubles, Illinois.
1832	Black Hawk War.
1832–1833	Nullification disturbances, South Carolina.
1833–1839	Cherokee disturbances.
1834	Pawnee Expedition, Indian Territory.
1835–1836	Toledo War, between Michigan and Ohio.
1835–1842	Seminole War, Florida.
1836–1837	Sabine disturbances, Southwestern frontier
	Creek disturbances, Alabama.
1837	Osage Indian troubles, Missouri.
	Alton, Ill., Riots.
1838	Heatherly Indian disturbances, Missouri and Iowa.
	Mormon disturbances, Missouri.
	Maine boundary trouble.
1838–1839	Patriot War, Canadian frontier disturbances.
1840–1842	Dorr War, Rhode Island.
1841–1846	Anti-Rent riots, New York.
1846–1847	Doniphan's expedition from New Mexico to Mexico.
1846–1848	Mexican War.
	New Mexico Revolt.
1848	Cayuse War, Oregon.
1849–1861	Navajo troubles, New Mexico.
1849	Astor Place Riot, New York.
	Continuous disturbances with Indians, Texas.
1850	Pitt River expedition, California.
1850–1860	Know-Nothing disturbances.
1851–1852	Yuma expedition, California.
1851–1853	Utah Indian troubles.
1851–1856	Indian wars in Oregon and Washington.
1855	Rendition of Anthony Burns, Massachusetts.
	Yakima Indian expedition, Washington Territory.
	Winnas expedition against Snake Indians, Oregon.
1856	Attack on Canton forts, China.

1855–1856	Cheyenne and Arapaho troubles.
	Seminole War, Florida.
1855–1860	Walker's expedition.
1856–1858	Kansas border troubles.
1857	Gila expedition, New Mexico.
	Sioux Indian troubles, Minnesota and Iowa.
	Mountain Meadow massacre, Utah.
1857–1858	Utah expedition.
1858	Puget Sound expedition, Washington Territory.
	Expedition against Northern Indians, Washington Territory.
	Navajo expedition, New Mexico.
	Spokane and other Indian troubles, Washington Territory.
1858–1859	Wichita Indian troubles, Indian Territory.
1859	Colorado River expedition, California.
	Pecos expedition, Texas.
	Antelope Hill expedition, Texas.
	Bear River expedition, Utah.
	San Juan trouble, Washington Territory.
	John Brown raid, Virginia.
1859–1860	Cortina troubles, Texas and Mexican border.
1860	Piute expedition, California.
	Kiowa and Comanche expedition, Indian Territory.
	Carson Valley expedition, Utah.
	Bannock Indian massacre, Snake River, Idaho.
1860–1861	Navajo Indian expedition.
1861–1890	Apache Indian wars and troubles, New Mexico and Arizona.
1861–1866	Civil War.
1862	New Ulm Indian massacres, Minnesota.
1862–1867	Sioux Indian wars, Minnesota and Dakota.
1863–1869	War against the Indians in Kansas, Nebraska, Colorado, and Indian Territory.
1863	The Draft Riots.
1865–1868	Indian wars in Oregon, Idaho, California, and Nevada.
1865–1866	Fenian raid, Canadian border.
1866–1870	Ku-Klux disturbances, Southern States.
1867–1881	Campaign against Lipan, Kiowa, Kickapoo, and Comanche Indians.
1868–1869	Canadian River Expedition, New Mexico.
1871	Yellowstone expedition.
	Fenian disturbances on the Manitoba frontier.
1872	Yellowstone expedition, Dakota.
1872–1873	Modoc campaign.
1873	Yellowstone expedition, Dakota.
1874–1875	Campaign in Indian Territory.
	Insurrection against Governor R. D. Kellogg, Louisiana.
1874	Sioux Indian expedition, Wyoming and Nebraska.
	Black Hills expedition, Dakota.
	Big Horn expedition, Wyoming.
	Race riots at Austin, Miss., and Trenton, Tenn.
1875	Eastern Nevada expedition.
1876	Sioux expedition, Dakota (Custer massacre).
	Powder River expedition, Wyoming.
	Massacre of negro militiamen by whites, Hamburg, S. C.
1876–1877	Big Horn and Yellowstone expeditions, Montana and Wyoming.
1876–1879	War against Northern Cheyenne and Sioux Indians.
1877	Nez Perce campaign.
1878	Bannock and Piute campaign.
	Ute expedition, Colorado.
1879	Sheep-eater Indian troubles, Idaho.
1879–1894	"Oklahoma Boomers" and Cherokee Strip disturbances.
1879–1880	Ute Indian campaign, Colorado and Utah.
1885	Chinese miner disturbances, Wyoming.
1890–1891	Sioux Indian disturbances, South Dakota.
1891–1893	The "Tin Horn War," Texas and Mexican border.
1892–1896	Trouble with renegade Apaches, Arizona and Mexican border.
1894	Coxey's Commonweal and other industrial army disturbances.
1898–1899	War with Spain.
1898	Chippewa Indian disturbances, Leech Lake, Minn.
1899–1902	Insurrection in Philippine Islands.
1903–1904	The Colorado mine disturbances.

JOHN R. MEADER,
Editor 'American Year-Book.'

United States of Brazil. See BRAZIL.

United States of Colombia. See COLOMBIA.

United States of Mexico. See MEXICO.

United States of Venezuela. See VENEZUELA.

United Synod of the Presbyterian Church. See PRESBYTERIANISM.

United Syrians. See SYRIAN CHURCHES.

United Workmen, Ancient Order of, a beneficial organization founded in 1868. In 1902 it had 44 grand lodges, 5,500 subordinate lodges, and over 500,000 members. In the same year it paid $8,895,952 in benefits.

Units of Measurement. When any physical quantity is to be measured, it is necessary to select a unit, in terms of which the magnitude of the quantity is to be expressed. We may, if we choose, select an entirely arbitrary unit for each different kind of quantity to be measured; or we may select certain arbitrary fundamental units as a basis, and construct upon these a consistent system of derived units. The first method is employed in English-speaking countries, and the second in those countries which employ the metric system. In scientific measurements, the second, or "logical" system is also employed, in practically all civilized countries at the present time.

In any system of units of measurement, it is necessary to select at least three units that are entirely arbitrary. It is customary (though not at all essential) to select, as the three fundamental units, the units for measuring length, mass, and time. In the English system, the fundamental unit of length is the yard. It is said that the yard was originally defined, by royal decree, as the length of the arm of King Henry I. It is doubtful if this is true; but at all events, the standard yard, at the present time, is defined as the distance, at 62° Fahr., between two marks upon a certain bar of bronze in the possession of the United States government. The foot is then defined as the third part of a yard, and the inch as the twelfth part of a foot. In the British system, the unit of mass is the avoirdupois pound, which is defined as the mass of a certain cylinder of platinum in the possession of the British government, which is marked "P. S. 1844"; the letters "P. S." signifying "Parliamentary standard." In the United States, the unit of mass is, theoretically, the "pound" of Queen Elizabeth; but in recent years, the British pound, as defined above, has been taken as the standard. The difference between the two probably does not much exceed two grains. In all civilized countries the fundamental unit of time is the second; the second being defined as the 86,400th part of a mean solar day, or the 86,400th part of the average interval between two successive passages of the sun across the meridian of any given place. In the metric system the fundamental unit of length is the metre; the metre being defined as the distance, at 0° C., between two marks on a certain bar of platin-iridium in the possession of the International Bureau of Weights and Measures, at Sèvres, France. The fundamental unit of mass, in the metric system, is the kilogram, which is defined as the mass of a certain piece of platin-iridium in the possession of the International Bureau of Weights and Measures. The kilogram was intended to be (and is, very nearly,) equal to the mass of a cubic decimetre of water, at the temperature (about 4° C.) at which water has its greatest density.

Secondary Units.—The various units that

are employed in measurement, in addition to the fundamental units described above, are defined, for the sake of precision, in terms of those fundamental units. The legal gallon in the United States, for example, is defined as the volume occupied by 8.3389 avoirdupois pounds of water, when the water is at the temperature at which its density is greatest, and when the weighing is performed in air while the barometer stands at 30 inches, and the atmospheric temperature is 62° F. Many of the secondary units that are used in English-speaking countries are as arbitrary as the gallon; but others are derived from the fundamental units in a perfectly definite way. The unit of work and of energy, for example, in English and American engineering practice, is the foot-pound; the foot-pound being defined as the work that must be done in order to overcome, through a distance of one foot, a force equal to the attraction that the earth exerts upon a pound of matter. (See FORCE and MECHANICS.) The attractive force that the earth exerts upon a pound of matter is often called a "pound." This is incorrect, however, for the pound (like the gram or the kilogram) is a unit of mass, and not of force. The "poundal" is the logical unit of force in the system of units in common use in English-speaking countries; the poundal being defined as the force which, when acting for one second upon a body whose mass is one pound, will communicate to that mass a velocity of one foot per second. The poundal is not in very general use, however, because in scientific work, where precision of statement and a high degree of numerical accuracy are of paramount importance, the "centimetre-gram-second" system of units is now almost universally employed.

The Centimetre-Gram-Second System.— The centimetre-gram-second system of units is so called because it is based upon the centimetre as the unit of length, the gram as the unit of mass, and the second as the unit of time. The name of the system is commonly abbreviated to "C.G.S." In the C.G.S. system, the unit of force is the "dyne"; a dyne being defined as the force which, when allowed to act for one second upon a body whose mass is one gram, will communicate to that body a velocity of one centimetre per second. The unit of work in the C.G.S. system is the "erg," this being defined as the quantity of work that is done when a force of one dyne is overcome through a distance of one centimetre. The unit of energy is also the erg, because energy is measured by the quantity of work that it can perform. The dyne is a very small unit in comparison with the forces that we commonly have to deal with in the physical world, it being only about 2 per cent greater than the attraction that the earth exerts upon a milligram of matter. To avoid the use of inconveniently large numbers in expressing forces, a unit called the "megadyne" is therefore used to some considerable extent, a "megadyne" being defined as equal to 1,000,000 dynes. This convention of prefixing "mega-" to indicate a unit of 1,000,000 times as great as the unit whose name follows the prefix is quite common. A quantity of work equal to 1,000,000 ergs, for example, is called a "megaerg," or more commonly a "megerg," or a "megalerg". The prefix "kilo-" is similarly used to signify a unit that is one thousand times as great as the unit to whose name it is prefixed; this being familiarly illustrated in the "kilogram" and the "kilometre." The prefix "micro-" is also employed to a considerable extent, to signify that the unit to which it relates is one one-millionth as great as the unit whose name follows the prefix. A "microfarad," for example, is a unit whose magnitude is the millionth part of a farad. (See below.)

The most arbitrary unit in the C.G.S. system is the "absolute atmosphere," which is defined as the pressure of a megadyne per square centimetre. This unit, however, has the advantage of being perfectly definite. Moreover, it is not greatly different from the ordinary pressure of the atmosphere. At sea-level in the latitude of Paris, for example, a column of mercury 76 centimetres high, and at a temperature of 0° C., exerts a pressure of 1.0136 megadynes per square centimetre; that is, a pressure of 1.0136 "absolute atmospheres."

All of the electrical and magnetic units that are now in common use are based upon the centimetre-gram-second system; and they illustrate, admirably, the convenience of that system.

Electrical and Magnetic Units.—A unit magnetic pole, in the C.G.S. system, is a magnetic pole of such strength that it will repel an equal pole, at a distance of one centimetre, with a force of one dyne. The intensity of a magnetic field, in this system, is numerically equal to the number of dynes of force that the field will exert upon a unit pole that is placed in it. The "moment" of a magnet is the product of the distance between its poles (expressed in centimetres) by the strength of one of these poles; and the intensity of magnetization of a magnet is numerically equal to the moment of the magnet, divided by the volume of the magnet in cubic centimetres.

In electrical measurements, two distinct sets of units are employed, these being known, respectively, as the "electrostatic units" and the "electromagnetic units," because one is commonly employed in calculations concerning static electricity, while the other is employed in work that relates to dynamic (or "current") electricity. Both sets are based upon the C.G.S. system, and it is likely that in the not very distant future a single set of units will be employed for electrical measurements of all kinds. At present, however, this is not feasible, on account of our temporary ignorance with respect to certain points which must be cleared up before the ideal single set of electrical units can be realized. Consult Lodge, 'Modern Views of Electricity'; Maxwell, 'Electricity and Magnetism.'

Electrostatic Units.—The absolute (or C.G.S) units for the measurement of static electricity are derived as follows: The C.G.S. unit of "quantity of electricity" is that quantity which would repel an equal quantity, situated at a distance of one centimetre, with a force of one dyne. The C.G.S. unit of electromotive force (or difference of potential) is that difference of potential through which a unit quantity of electricity must be raised, in order that the work done shall be one erg. The capacity of a conductor, in C.G.S. measure, is the quotient obtained by dividing the quantity of electricity upon the conductor by the potential which this quantity of electricity produces in the conductor. (The capacity of an isolated sphere is numerically equal to the radius of the sphere, as

expressed in centimetres.) The unit of current is the current which conveys one unit of electricity in one second of time.

Electromagnetic Units.—The units that are employed in the measurement of dynamic (or current) electricity are derived as follows: The unit of current is the current which, when flowing along a circular arc one centimetre in length and one centimetre in radius, produces, at the centre of the arc, a magnetic field of unit intensity. The unit of "quantity of electricity" is the quantity of electricity that a unit current conveys in one second. The unit of electromotive force (or of difference of potential) is a difference of potential of such magnitude that to cause the flow of a unit quantity of electricity against it requires the expenditure of one erg of work. The unit of resistance is the resistance through which a unit current would be produced, by one unit of electromotive force. The unit of capacity is the capacity of a conductor whose potential is increased by unity, by the addition to the conductor of one unit of electricity. The absolute electrical units, in the electrostatic and electromagnetic systems, have not (in general) received definite names; it being sufficient, in calculations in which these units are employed, to speak of a certain number of "C.G.S. units of electricity," or "C.G.S. units of resistance," etc. For the practical measurement of dynamic electricity in the laboratory and the power house, the absolute (or C.G.S.) units are not of convenient size; and for them it is therefore customary to substitute certain more convenient multiples and submultiples of the electromagnetic units, as they are defined above. The modified units are known as the "ohm," "ampere," "volt," etc., and are considered in the following paragraph.

Practical Electrical Units.—The unit of resistance that is employed almost universally in practical electrical work is the "ohm," which was named for G. S. Ohm, the distinguished physicist and discoverer of Ohm's law. This is defined as equal to 1,000,000,000 (or 10^9) C.G.S. electromagnetic units of resistance; the ideal standard having precisely this resistance being called, for the sake of distinct identification, the "true ohm." Many physicists have investigated the value of the ohm, as here defined, and have constructed material standards for practical work, having a resistance of one ohm, as nearly as possible. A committee appointed by the British Association for the purpose of investigating the value of the true ohm, prepared a coil of German silver wire, which, at a certain definite temperature, was supposed to have a resistance of practically one ohm; and this coil, from the time of its acceptance by the British Association in 1864 down to the year 1884, was the standard ohm of the world, being known, for definiteness, as the "British Association ohm," or, more briefly, as the "B.A. ohm." It is now customary to define the practical ohm in terms of the resistance of a column of mercury of stated dimensions and temperature, as it is found that the resistance of a solid conductor depends not only upon the material of which the conductor is made, but also upon the physical state of that material with respect to internal stresses and other circumstances. The B.A. ohm of 1864 has a resistance equal to that of a column of pure mercury having a constant cross section of one square millimetre, and a length of 104.83 centimetres; the temperature of the mercury being 0° C. This standard was subsequently found to be materially smaller than the true ohm, and the International Congress of Electricians at Paris, in 1884, adopted, as the equivalent of the ohm, a column of mercury having a constant cross section of one square millimetre, and a length of 106 centimetres; the temperature of the mercury being 0° C., as before. This standard is known as the "legal" or "congress" ohm. Several of the physicists present at that congress were of the opinion that the length of the column should be 106.2 or 106.25 centimetres; but the decimal being admittedly uncertain, it was finally agreed to disregard it entirely, until further experimental evidence could be had. In August 1893 an International Congress of Electricians was held at Chicago; England, France, Germany, Italy, Austria, Switzerland, Sweden, Mexico, Canada, and the United States being represented. This congress adopted another and (presumably) better value of the ohm, the new standard being designated as the "International ohm." The International ohm, which has since been adopted by the nations represented at the conference, was defined as "the resistance offered to an unvarying electrical current by a column of mercury (at the temperature of melting ice) 14.4521 grams in mass, of a constant cross-sectional area, and of the length of 106.3 centimetres." The conference preferred, it will be seen, to fix the sectional area by giving the mass of the column, rather than by stating the sectional area directly. The intention was, however, that the sectional area shall be sensibly one millimetre; for a column of mercury 106.3 centimetres long and having a mass of 14.4521 grams, would have a sectional area, at 0° C., of between 1 and 1.00003 square millimetres. The ohm thus defined by the Chicago congress is probably very near to the true ohm.

The practical unit of current is the "ampere," named for the French physicist, A. M. Ampere. It is defined as equal to one tenth of a C.G.S. electromagnetic unit of current. The Chicago International Congress of 1893, after considering the available experimental evidence, concluded that the ampere can be defined, for practical purposes, as equal in magnitude to the unvarying current which will deposit 0.001118 gram of metallic silver every second from a solution of nitrate of silver in water. This particular estimate of the value of the true ampere is called for definiteness, the "International ampere." The practical unit of electromotive force the "volt," which was named for the Italian physicist, Alessandro Volta, and which is defined as equal to 100,000,000 (or 10^8) C.G.S. electromagnetic units of difference of potential or as the electromotive force which is required in order to maintain a current of one ampere through a resistance of one ohm.

Of the remaining practical electrical units, the coulomb, farad, joule, watt, and henry call for special mention. The coulomb is the practical unit of electrical quantity. It may be defined either as one tenth of the C.G.S. electromagnetic unit of "quantity of electricity," or as the quantity of electricity conveyed by an ampere in one second. The farad (named for Faraday) is the practical unit of capacity, and may be defined either as the 1,000,000,000th part

of a C.G.S. electromagnetic unit of capacity, or as the capacity of a condenser which holds one coulomb of electricity, when charged to a potential of one volt. The farad is much too large for convenience, and although it is called the "practical" unit of capacity, it is replaced, in practice, by the "microfarad," which is equal to the millionth part of a farad. The condensers which are in ordinary use are commonly made to have capacities of a microfarad, or of some decimal subdivision of a microfarad. The "joule" is the practical unit of work (or energy) in the electrical system of units, a joule being defined as 10,000,000 (or 10^7) ergs; and its practical convenience depends upon the fact that it is equal to the quantity of energy that is expended in one second by a current of one ampere acting through a resistance of one ohm. The watt is the corresponding unit of power, and is defined either as the expenditure of 10,000,000 ergs per second, or as the rate at which energy is expended when a current of one ampere flows through a resistance of one ohm. In dealing with the large currents that occur in modern electrical power-houses, the watt is an inconveniently small unit, and the kilowatt is almost invariably used in its place; a kilowatt being equal to 1,000 watts. A horsepower is equal to 746 watts, or to 0.746 of a kilowatt. The henry (named for Joseph Henry) is the practical unit of inductance, and it is defined as the induction in a circuit, when an electromotive force of one volt is induced in this circuit while the inducing current varies at the rate of one ampere per second.

Dimensions.— A surface is said to have extension in two dimensions, and a solid is similarly said to have extension in three dimensions. The volume of a cube, for example, is found by multiplying together the length, width, and height of the cube; and hence we may say that the volume in question is of three "dimensions" in terms of L, the unit of length employed. This mode of expression has been extended to other units besides units of length, and the idea has proved itself quite useful in numerous ways. For example, a velocity is found by dividing a length by a time; so that if L represents a length and T a time, we may write $V = LT^{-1}$; and we say that velocity is of dimension $+1$ in length, and -1 in time. Similarly, force is measured by the change of momentum that it produces, in a given mass, per unit of time. That is, it is found by multiplying a mass (which we may represent by M) by a velocity, and dividing the product by a time. That is, $F = MV/T$. But we have already found that $V = LT^{-1}$, and hence the equation becomes $F = MLT^{-2}$, and we say that force is of dimensions $+1$ in mass and in length, and of -2 in time. The equations here given are called "dimensional equations," since in writing them we pay no attention to the actual numerical magnitudes of the quantities involved, but only to the "dimensions" of those quantities. As a further illustration of the "dimensions" of a physical quantity, let us consider the case of work. This is defined as the product of a force by a distance, and hence we have $W = FL = MLT^{-2}\ L = ML^2T^{-2}$, and we say that work is of dimensions $+1$ in mass, $+2$ in length, and -2 in time. Kinetic energy is found by taking half the product of a mass and the square of a velocity. Omitting the numerical factor $\frac{1}{2}$ (since it does not affect the dimensions of the energy in any way), we have $E = MV^2 = M(LT^{-1})^2 = ML^2T^{-2}$, so that kinetic energy is of dimensions $+1$ in mass, $+2$ in length, and -2 in time That is, it is of the same dimensions in all respects as work; which is evidently correct, since work and kinetic energy are mutually convertible. As an illustration of the determination of the dimensions of a quantity when those dimensions are much less obvious, consider the dimensions of a "quantity of electricity," as expressed in electrostatic units. Let Q denote a charge of electricity, as expressed in electrostatic units. Then if a similar charge were brought near to the first one, the repulsion between the two would be found by dividing the product of the two charges by the square of the distance between them. Hence the dimensions of the repulsion between the two charges would be Q^2L^{-2}. But this repulsion, being a force, must be of the dimensions $F = MLT^{-2}$; and hence we have $Q^2L^{-2} = MLT^{-2}$; whence $Q = M^{\frac{1}{2}}L^{\frac{1}{2}}T^{-1}$. That is "quantity of electricity," as expressed in the electrostatic system, is of the dimensions $\frac{1}{2}$ in mass, $\frac{3}{2}$ in length, and -1 in time. For the dimensions of other electrical magnitudes, and for the interesting facts that are known relatively to the ratios of the dimensions of the various electrical units, special works on these subjects must be consulted. Maxwell pointed out that in any equation that expresses a fact in nature, the several terms that are added together, or equated to one another, must be all of the same dimensions; a fact of which use has been made above, in determining the dimensions of "quantity of electricity."

As an illustration of the kind of information that can sometimes be had from dimensional equations, in constructing a formula of which we know the general but not the precise form, let us consider the case of the pendulum. Let us suppose that we know that the time of oscillation of a pendulum, through a small arc, varies as some power of the length of the pendulum, multiplied by some power of the intensity of gravity at the place where the experiment is made, and let us seek to find what these unknown powers are. Representing the intensity of gravity by g, and the unknown exponents by x and y, respectively, the foregoing assumption with respect to the general form of the dependence of the period upon the length of the pendulum and the intensity of gravity gives us an expression of the form g^xL^y, for the time of oscillation of the pendulum. Now g, being an acceleration, is of the dimensions LT^{-2}; so that the foregoing expression is of the dimensions $(LT^{-2})^xL^y$; but this, being the expression for the time of oscillation of the pendulum, must itself be of the dimensions T. Hence we have $(LT^{-2})^xL^y = T$, or $L^{x+y}T^{-2x} = T$. This being an identity, we have, by equating the exponents of T, $-2x = 1$, or $x = -\frac{1}{2}$. And since we also have $x + y = 0$, we see that $y = +\frac{1}{2}$. Hence the time of vibration of the pendulum varies directly as the square root of the length of the pendulum, and inversely as the square root of the intensity of gravity. See METRIC SYSTEM; WEIGHTS AND MEASURES. Consult also, Everett, 'Units and Physical Constants.'

A. D. RISTEEN, PH.D.,
Editorial Staff, 'Encyclopedia Americana.'

Universal German Working Men's Association. See SOCIALISM.

Universal Language, or World Language, a language that may serve as a means of communication among all the peoples of the earth, or at least all cultured peoples. The project of a universal language has engaged the attention of scholars ever since the days of Leibnitz, and actually existing languages, as English or French, or a dead language, as Latin, or an artificial language, as Volapük and Esperanto (qq.v.), have been proposed, each in turn, as meeting all the requirements. National jealousies, were there no other objections, present an insurmountable obstacle to the adoption of any living language as the universal medium of communication, as the same feeling has prevented the universal adoption of a prime meridian. Nor would the opposition to any living language, English, for example, be simply Chauvinistic: the adoption of English would give to the English-speaking nations an immense advantage over all others in commerce: English books would be read everywhere, and the thought and civilization of the world at large would be transformed — Anglicized. The adoption of Latin is practically out of the question for one reason, because it is entirely too difficult to learn. If living languages must be ruled out, the proposed world language must be an artificial construction. The essential conditions with which such an artificial language must comply, as defined by the International Congress of Philosophy, which was held at Paris in 1900, are: (1) That the new language shall serve the needs of daily life and business as well as the requirements of science and learning; and, (2) that it shall be so simple that a person possessing an average common school education can acquire it readily. That the artificial language Esperanto to a considerable extent fulfils these conditions appears from the fact that at the International Geological Congress held in Vienna 1903, three of the delegates, a Norwegian, a Rumanian, and a Belgian, none of them understanding the national speech of the others, found in Esperanto a sufficient means of communication on all scientific subjects. In 1879 was published the scheme of a world speech, called Volapük, a word made up from world and speak or speech. Volapük was invented by Johann Martin Schleyer, a Catholic priest of Baden; its elements are derived from the West-European languages Teutonic and Latinish. Its alphabet comprises 27 letters, namely the vowels *a, e, i, o, u, ä, ö, ü,* and these 17 consonants, *b, p, h, y, g, k, l, r, m, n, s, j, c, x, z.* The vowels are pronounced as in German, the consonants as in English, except that *g* is always hard, *s* is always sharp, *c* is like *j*, and *z* is equal to *ts.* There are 10 other consonant signs for sounds peculiar to various languages: there are no silent letters and no diphthongs. About 40 per cent of the root words of Volapük, which usually are nouns, are from English, the rest are chiefly from German, French, and Latin. In choosing root words the desiderata were brevity, clearness and ease of utterance: every root word consists of one syllable, a vowel between two consonant sounds: man is *man, dom* is house (Lat. *domus*), *tim* is time; and root words are formed from ordinary words either (1) by substituting a consonant for a final vowel: Eng. pay becomes *pel,* Fr. mer (sea) becomes *mel;* or (2) consonants and vowels are dropped: Lat. pons (bridge) becomes *pon,* Eng. state becomes *tat;* or (3) the most important syllable alone is retained: Lat. sapientia (wisdom) becomes *sap.* Here are some examples of root words from different languages: From Eng. gift, *giv,* lady, *läd,* woman, *vom;* from Lat. finis (end) comes *fin,* flumen (river) *flum,* tensio (stretching) *ten.* From these root words, which are nearly all nouns, are formed the other parts of speech — verbs, adjectives, adverbs — by proper prefixes and suffixes. Nouns have four cases, namely, nominative, genitive, dative and accusative. The nominative is the unmodified root, for example, *val,* world, is in the nominative case. The genitive adds *a, vola,* of the world; *vola pük,* world's speech. The dative and accusative respectively add *e* and *i* to the root; *vole,* to the world, *voli,* the world (objective case). The pronouns I, thou, he, she, it, are *ob, al, om, of* and *os,* and they are declined like nouns: *oba,* of me, *obe,* to me; *ala,* of thee, *ale* to thee; and so on. The tenses of verbs, except the present, are formed by prefixing the vowels *ä, e, i, o,* and *u* to the root; thus *löfob* (*löf,* love, *ob,* I) is I love, *älöfob,* I loved, *elöfob,* I have loved, *ilöfob,* I had loved, *olöfob,* I shall love, *ulöfob,* I shall have loved: by putting *al,* thou, *om,* he, *of,* she, in the place of *ob,* I, we get the forms for thou hast loved, he will love, she had loved, etc. By similar devices the various moods are indicated, for example, the ending *ös* added to the present indicative *löfom,* he loves, makes it optative, may he love, *löfomös.* The passive voice is formed by prefixing *p* or *pa.* Thus, *palöfon,* to be loved, *palöfob,* I am loved, *pälöfob,* I was loved, *pelöfob,* I have been loved, *polöfob,* I shall be loved, *pulöfob,* I shall have been loved. The adjective is the noun with *ik* suffixed: *gud,* goodness, *gudik,* good; *yun,* youth, *yunik,* young. The adverb is formed from the adjective by adding *o: gudik,* good, *gudiko,* well. In pronunciation every syllable is long and the accent is always laid on the last syllable of the word. Volapük was received with great favor immediately after the scheme was published. The first "Congress of Volapükians," held in Switzerland in 1886, had 300 delegates: a few years later the students of Volapük numbered 250,000.

JOSEPH FITZGERALD,
Author of 'Word and Phrase.'

Universal Prime Meridian. See LATITUDE; LONGITUDE.

Universal Time. See TIME.

Universalism, the belief in the final triumph of good over evil in the Universe. As applied to the human economy it is the belief that God is pledged by his goodness and omnipotence to overcome and destroy sin and save ultimately the "whole family of mankind." Universalists claim that they can find this tenet in the teachings of primitive Christianity, and it was held among other notable writers of the early Church, by Clement of Alexandria, and Origen. From the inception of the Protestant Reformation to the close of the 18th century, both on the Continent of Europe,— in Holland, Switzerland, France,— and in England, there rose from time to time eminent theologians who ventured to proclaim the

doctrine. Sometimes great schools of thought, like the Mystics and the Anabaptists, were tinctured by it.

It is only in North America, however, that it has served as the basis of an organized Christian denomination. The Universalists of America trace the beginning of their order directly to John Murray, who came to this country from England and landed on the New Jersey coast at a place called Good Luck about 20 Sept. 1770. There he met one Thomas Potter, who had erected a church which he said was waiting for the minister whom God would send to preach in it. As soon as Mr. Potter saw Murray, he declared that he was the minister for whom he was waiting. Much against his will, and after resisting the solicitations of Mr. Potter for more than a week, under circumstances which seem to some almost miraculous, and which are certainly highly romantic, Mr. Murray at length yielded. Thus began his remarkable career as the preacher of what was then a new doctrine in America and the founder of a sect of considerable importance to-day.

Mr. Murray had never intended the ministry as a profession. He had been brought up as a strict Calvinist, but from very early life had associated with the Methodists, having been made a class leader by John Wesley when he was scarcely more than a youth. Later he became a communicant in Whitfield's Tabernacle in London. He was a very diligent reader of the Scriptures, very devout and thoughtful. By accident, he was brought in contact with the Rev. James Relly, an independent preacher of Universalism. The task was given him to bring back into the fold of the Tabernacle a young woman who had become a convert to Mr. Relly. The task was not so easy as he imagined it would be; for instead of confounding her by his questions she confounded him by her answers. His curiosity was thus piqued and he began to investigate. First he read Relly's 'Union,' a book in which the preacher had set forth his peculiar views; then he became an attendant on Relly's preaching, and finally he announced himself a complete convert. About this time his young wife, to whom he was devotedly attached, died. He was thrown into the deepest despondency, and being unable to rally from his grief, he sought to find oblivion and rest in the wilderness of America. His strange meeting with Thomas Potter changed the trend and purpose of his life. For a period of three or four years he continued to make his home with his new-found friend. But his fame gradually spread abroad, invitations began to pour in upon him from far and near. In responding to these his message was carried along the Atlantic seaboard from New Jersey to New Hampshire. He made many warm friends in Rhode Island, among them Cols. Greene, Lincoln, and Varnum, at whose instance, on the breaking out of the Revolutionary War, he was made chaplain of the Rhode Island Brigade.

On one of his northerly visits he was invited to Gloucester, where he found a company of people who had seen and read a copy of Relly's 'Union' and been powerfully influenced in favor of its teachings. These formed the nucleus of a congregation; and at their earnest solicitation he decided to take up his residence among them and become their pastor. The "Independent Christian Church,' of Gloucester, enjoys the distinction of being the first organized Universalist Church in America. But it did not long remain alone. By the end of the century, or in less than a generation from the landing of Murray, a considerable number of congregations had been gathered. There was at least one such congregation in most of the leading towns of New England, and churches were also to be found as far south as Philadelphia. These were ministered to, for the most part, by a body of remarkable men, some of whom, like Elhanan Winchester, George Richards, Edward Turner, Walter Ferris, and Hosea Ballou, are still famous. In April 1785, an organization of churches, in the eastern part of Massachusetts mainly, was effected under the name of Universalists. This organization constantly enlarged its membership, and may be regarded as the forerunner of what is now known as the Universalist General Convention.

In this constantly widening extension of the doctrine, of course, the first impulse was given by Murray. Many doubtless owed their first conception and conviction directly to him. As was natural, however, almost from the start there was not a little variety of opinion. Men of such eminence as many of the clergy of that period were likely to work out the problems for themselves. The doctrine, as reasoned by Relly and proclaimed by Murray, was crude and fanciful. It was scarcely more than an ill-conditioned graft upon the Calvinistic tree. Taking the Scriptural affirmation that Christ died for all men and the assertion of Calvinism that all for whom Christ died will be saved, Relly reached the conclusion of universal salvation. Both Relly and Murray made a distinction between redemption and salvation, arguing that Christ had paid the price, purchased or redeemed the whole human race. This redemption was appropriated by each individual through faith. Mr. Murray was not, however, always consistent in maintaining this distinction.

On 25 May 1790 a convention was held in Philadelphia for the purpose of drawing up articles of faith and a form of church government. In this convention, of which Mr. Murray was a member, there were representatives from churches in Massachusetts, Virginia, New Jersey, and Pennsylvania. The articles of faith adopted were five in number and related to (1) the Holy Scriptures, (2) the Supreme Being, (3) the Mediator, (4) the Holy Ghost, (5) Good Works. These declarations, while cast in the common mold of the prevailing theology of the time, are yet broad and elastic in their scope. How far these articles were accepted by the Universalist churches in general it is impossible now to determine. In 1803, however, at a meeting of the Universalist General Convention in Winchester, N. H., a Profession of Belief was adopted which has since been the basis of fellowship and faith in the Universalist denomination. That profession is as follows:

ARTICLE I. We believe that the Holy Scriptures of the Old and New Testaments contain a revelation of the character of God and of the duty, interest and final destination of mankind.

ARTICLE II. We believe that there is one God, whose nature is Love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness.

ARTICLE III. We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practice good works; for these things are good and profitable unto men.

In the convention at Winchester and taking part in the discussions was a young man, Hosea Ballou, then 32 years of age, who had already made publicly a declaration of principles widely different from those advocated by either John Murray or Elhanan Winchester. He was about to publish (in 1805) a work entitled, 'A Treatise on Atonement,' in which he had worked out a new and original system of theology. Starting with the premise of the universal fatherhood and infinite love of God, he carved out for himself a new path in theological belief, and really settled the essential principles of what is now known as the ethical theology. A contemporary writer said:

> In the 'Treatise on Atonement,' he had treated the subject at length, maintaining the subordination of the Son to the Father, the eternal and infinite love of God to all creatures, and holding forth the death of Christ not as a cause, but as the effect of this eternal principle of the divine nature.

The treatise is remarkable in view of the fact that Mr. Ballou, as he himself says, "never read anything on the doctrine of universal salvation before I believed it, the Bible excepted; nor did I know, that I can now recollect, that there was anything published in its vindication in the world." Again, "when . . . I wrote my 'Notes' and 'Treatise' I had never seen any work in defence of the doctrine of the Divine Unity, and the dependency of the Son upon the Father."

The points argued in the work are, first, sin, its nature, origin, and consequence, showing that it is a voluntary transgression of the law, that it is not an inherited condition, neither the work of a personal devil, and that its consequences are experienced in the unhappiness and degradation of the soul; secondly, the human will, that it is free, and yet, that its freedom will not be permitted to the extent of defeating the purposes of God; thirdly, the atonement, that, in opposition to current theories of a substituted punishment designed to affect the mind and disposition of God toward the sinner, it was a voluntary sacrifice on the part of Christ, the whole object of which was to draw men away from sin and reconcile them to God; fourthly, the person of the Mediator, that he is a created being subordinate to and dependent upon the Father, whose supremacy he acknowledged in the act of prayer, and yet a being to whom the Father gave all power in heaven and on earth to the end that he might reconcile all things unto himself; and finally, the consequences of atonement, that they would be complete in the reconciliation of every soul to God.

Almost immediately the greater part by far of the Universalists of that day accepted this new statement of their belief. A preponderating majority of the Universalist clergy accepted almost without question the new leadership. A considerable number, however, especially of the older men did not go to the full length of Mr. Ballou's reasoning. Mr. Murray of course remained steadfast in his old opinions. Others hesitated and doubted the soundness of Mr. Ballou's conclusions. Gradually a breach was created, more especially with reference to the doctrine of a general judgment and future retribution for sin. The assertion of Mr. Ballou that "the effects of sin, as sin, are not endless, but are limited to the state in which it is committed," together with the declaration that the Scriptures are silent as to any consequences of sin beyond the grave caused many to halt. Accordingly, in 1831, Paul Dean, Charles Hudson, Adin, Ballou, David Pickering, and a number of other clergy only less distinguished, withdrew from the fellowship of the Universalists and sought to form a new denomination under the title of Restorationists. Their effort, however, was abortive, and most of these gentlemen soon found fellowship among the Unitarians.

Since that time the Universalist denomination has continued without signs of disruption. The teachings of Hosea Ballou have constituted the foundations on which the doctrines of the Universalist churches are based. These doctrines have undergone important modifications in conformity with the constantly widening area of human knowledge, the profounder and more accurate as well as the more rational interpretation of Scripture and the growing liberality of the age. For a considerable period there was a widespread dissatisfaction with the phraseology of the second article of the Winchester Profession. For a period of 20 years an effort was made in successive sessions of the Universalist General Convention to secure some modification of this phraseology. The discussion was brought to a conclusion at the session held in Boston, in 1899, by the adoption of the following declaration:

> The conditions of fellowship shall be as follows:
> 1. The acceptance of the essential principles of the Universalist Faith, to wit: 1. The Universal Fatherhood of God; 2. The Spiritual authority and leadership of His Son, Jesus Christ; 3. The trustworthiness of the Bible as containing a revelation from God; 4. The certainty of just retribution for sin; 5. The final harmony of all souls with God.
>
> The Winchester Profession is commended as containing these principles, but neither this nor any other precise form of words is required as a condition of fellowship, provided always that the principles above stated be professed.
>
> 2. The acknowledgment of the authority of the General Convention and assent to its laws.

In the latter part of September 1870, the 100th anniversary of the landing of John Murray in America was celebrated by the holding of the session of the General Convention in Gloucester, Mass. The occasion drew together many thousands of people from all parts of the country. As the number in attendance was greater than the power of public and private hospitality combined could care for, tents were erected in a large vacant plot of ground overlooking the sea, one mammoth tent being erected in the midst of them for the public gatherings. In this tent, Dr. T. J. Sawyer, Dr. A. A. Miner, Dr. E. H. Chapin, Horace Greeley, and other eminent men, both clerical and lay, of the period were

heard to the abundant satisfaction of the people. The celebration was made the occasion of raising a fund of $100,000 to be known as the Murray Centenary Fund, the income to be devoted to missions, church extension, and the education of candidates for the ministry. At this session also a complete reorganization of the General Convention was effected. With slight modifications, the organization remains unchanged.

The Universalist General Convention, having jurisdiction over the ecclesiastical organizations of the Universalist Church in the United States and Canadian provinces, meets biennially, on the Wednesday preceding the fourth Sunday in October. The Convention is composed of the Presidents, the Vice-Presidents, and the Secretaries of the State Conventions, and of clerical and lay delegates from the State Conventions, each State being entitled to two clerical and four lay delegates and to an additional number of each class of delegates in proportion to the aggregate of its parishes and clergymen. At least four parishes must be organized and established in a State before a State Convention can be formed, but a less number of parishes may unite to choose two delegates, clerical or lay, to represent them in the General Convention; and if there be one parish so situated, it is entitled to two delegates. In all such States or Territories the General Convention has original jurisdiction.

All laws relating to fellowship, ordination, and discipline originate in the General Convention, and it is the final court of appeal in all cases of dispute or difficulty between State Conventions. It is an incorporated body, empowered to hold real and personal estate to the value of $500,000, «to be devoted exclusively to the diffusion of Christian knowledge, by means of missionaries, publications, and other agencies.» In the interim of sessions the interests of the Convention are watched over and managed by a board of trustees. The funds of the Convention, as reported in 1902, aggregate $364,319.25. There are now (1904) 43 State Conventions; 982 parishes, containing 54,619 families; 877 church organizations with a membership of 54,102 persons; 778 Sunday schools with a membership of 55,625; 790 church edifices of a total valuation of $10,255,460; there are nearly 750 clergymen in fellowship.

The last 50 years of denominational history has been particularly marked by activity in the founding and development of educational institutions. There are now under the nominal patronage and control of Universalists four of collegiate rank, namely, Tufts College in Massachusetts, Saint Lawrence University in New York, Buchtel College in Ohio, and Lombard College in Illinois, and three Academies, namely, Dean Academy, in Massachusetts, Goddard Seminary in Vermont, and Weetbrook Seminary in Maine. Tufts College, the oldest and most important of the colleges, is an institution of university rank. It has 186 teachers, nearly 1,000 students and embraces, besides the usual college of letters, the following departments: A divinity school, an engineering department, a medical school, and a dental school. All the educational institutions under denominational control give instruction to 2,200 pupils and have a combined endowment of over $4,000,000.

Thus it will be seen that the Universalist Church is thoroughly organized for the work of a living Christian denomination. It is true that the ethical principle which is central in its theology has been accepted by nearly every body of Protestant Christians throughout the world. Its peculiar ideas of eschatology have also spread very widely in all the more progressive organisms of Christendom. Still the adherents of this church lift up their banner with confidence and look with faith to the future, holding steadfastly to the traditions of their great founders.

Consult: Winchester, 'The Universalist Restoration' (1843); Ballou, 'A Treatise on Atonement' (1903); 'The Ancient History of Universalism' (1872); Dean, 'The Final Restoration' (1832); Moore, 'Universalism, the Doctrine of the Bible'; Brooks, 'Universalism: A Practical Power' (1863).

ELMER HEWITT CAPEN, D.D.,
Late President of Tufts College.

Universe. In the article STARS will be found a description in detail of those wonderful bodies which stud the sky. In the present article we consider these bodies as forming a connected whole, which we call the universe, and which comprehends creation in its widest extent. Many questions connected with the universe are not yet answered; but our ideas of its structure are surely though slowly advancing. The object of the present article is to set forth what can be said on the subject at the present time.

The first question to arise is the oldest. Is the collection of heavenly bodies — stars and nebulæ,— which we see with our telescopes, a bounded whole of any kind; or do such bodies extend through infinite space, so that those we see are distinguished from the others only by their proximity to our system? The general trend of modern science is toward the former alternative. While it is quite true that no limit can be set to the possible extent of creation, the evidence is very strong that that portion of creation which can be studied by man forms a bounded whole, having certain common characteristics which run through its whole extent. It seems almost certain that there is a limit in every direction beyond which the stars become comparatively few and scattered, if they exist at all. The most simple and conclusive proof of this is the fact that, if the stars extended out without limit, their infinite number would fill the whole sky with a blaze of light equal to that of the noon-day sun. Instead of this we have a night-sky so faint that a circle of it half a degree in diameter is almost or quite invisible to the eye. Another idea of the subject may be based on the principle that in a universe of stars, extending out indefinitely, there would be nearly four times as many stars of each order of magnitude as of the order next brighter. This is true in the case of the stars visible to the naked eye. But, when counts are made of the telescopic stars, it is found that although the number of each successive order increases, the ratio of increase continually diminishes, thus showing that a limit must finally be reached.

Another indication bearing on the same ques-

tion is afforded by the Milky Way. This vast girdle, which consists of agglomerations of stars, has a unity of structure throughout its whole extent which justifies us in considering it as, in a certain sense, a single object. The stars which comprise it are probably more distant than the others and may, therefore, be considered as forming a band including the universe within it.

Another conception of the universe is gained by considering the thickness with which the stars are scattered through space; in other words, how many stars a given volume of the celestial spaces, in the general average, may contain. Measures of parallax, and studies of proper motion, lead to the conclusion that the thickness of the stars, as thus defined, is a fairly definite quantity. To measure the volume of space we require a unit. The most convenient unit for our purpose is the volume of a sphere whose centre is in the solar system, and whose surface is at a distance represented by a parallax of half a second. This distance is, in round numbers, 400,000 times that of the sun from the earth, a space through which light would travel in about seven years. The volumes of spheres being as the cubes of their radii, it follows that a sphere whose surface is at twice the distance of the unit sphere, or 400,000 times the distance of the sun, will have a volume represented by the number 8, while 100 times the radius will have a volume of 1,000,000 units. Now, the indications are that the stars are strewn through space with such thickness that, in the general average, each unit of space contains one or two of these bodies. The law according to which the stars thin out, and investigations into the statistics of the stars generally, lead to the conclusion that the parallax of the most distant of these bodies is about 0″001. This distance is 500 times that which we have chosen as the radius of our unit sphere; the volume of space included within it is, by the law of cubes, 125 millions and, were the stars scattered with equal thickness throughout the whole space, the number contained would be between 125 and 250 millions.

Although, in the general average, it is probable that the thickness of the stars in space does not vary greatly within the limits we have indicated, there are exceptions in special cases. The most notable exception is that of the Milky Way, where the stars are undoubtedly much more thickly strewed in space than they are in the central regions of the system. We also find in many regions of space collections of hundreds or even thousands of stars evidently in close proximity to each other. But outside of these collections the scattering is probably nearly uniform as far out as the limit we have mentioned.

Altogether, we may say with some confidence, that if we could fly through space to a distance over which light would require 4,000 years to travel, we should find ourselves approaching the boundary of the stellar system, if we were not actually outside of it.

Notwithstanding the darkness of the sky, it seems probable that we receive more light from it than could be supplied by all the stars, seen and unseen, which make up the known part of the universe. This conclusion is based on the fact that the amount of light received from a circle 1° in diameter on the darkest night-sky is about equal to that of a star of the 5th magnitude, while, when we carry out the progression in the light of the stars of diminishing orders of magnitude, we find that the total of their light could not well amount to so great a quantity as this. The source of this excess of light is yet to be investigated. Whether it is atmospheric, whether it is reflected from innumerable opaque bodies, or whether it is emitted by a nebulous mass of almost inconceivable tenuity, has not yet been determined.

A remarkable feature of our relation to the universe is that our solar system seems to be very near its centre. That we are near the central plane of the Milky Way is shown by the fact that the latter is nearly a great circle on the celestial sphere. It is true that the most exact determination yet made shows a slight displacement of our system, since the central line of the Milky Way is about 1° from that of the great circle which would pass nearest to it. Another basis for the same conclusion is that the stars seem about equally numerous in the direction of the two opposite poles of the Milky Way. If there is any deviation from equality, it seems likely that the faint telescopic stars are fewer in number toward the south pole than toward the north pole of the Milky Way. This view is not yet proved, and cannot be until we have more exact counts of the stars of each order of magnitude in the two hemispheres. The question whether our system is situated with equal exactness in the centre of the great girdle does not admit of settlement. All we can say is, that, up to the present time, there is no positive evidence on which to base a statement that we are any nearer one point of the girdle than another. It is indeed true that, in the constellations Aquila and Sagittarius, which are visible in the south on autumn evenings, the Milky Way shows numerous rifts and vacant spaces which are not shown on its opposite side. This might seem to indicate that we are nearer to it in this region. But further researches are required before a definite conclusion can be reached.

It should be remarked that, even if we are at present centrally situated, the position cannot be permanently held. The motion of the solar system through space, by which we are carried forward on a journey of which we can see neither the beginning nor the end, at the rate of ten or twelve miles a second, must eventually carry our posterity away from the centre of the universe, even if we are now situated near that point. But this motion will have to be continued hundreds of thousands, even millions, of years before the displacement would be appreciable when compared with the dimensions of the universe.

S. Newcomb.

University, an institution for the promotion of higher education by teaching and investigation, and having the right to confer degrees in several faculties. Though there were Greek and Roman institutions of learning analogous to universities, the university as above defined did not originate till the 12th century. The name university is still later, not being found in any application at all like the modern one till the 13th century. Such phrases as *universitas magistrorum et auditorum* (or *scholarium*), meaning the whole body of teachers and

scholars, are met with at the very beginning of the 12th century; but it was not till the next century that the term *universitas* acquired a technical sense, and came to be used by itself pretty much as we use it. The three oldest universities, those of Bologna, Paris, and Oxford, grew out of schools that had previously attained a more or less widespread fame as seats of learning.

In the early part of the 12th century Bologna acquired great celebrity as a school of law; later in the same century the lectures of Abelard on philosophy and theology attracted to Paris hearers from all parts of Europe; and by the middle of the 11th century there were undoubtedly schools at Oxford. Earlier by a century than the oldest of these schools there existed a famous school of medicine at Salerno, in lower Italy, but it was long before it obtained the rank of a university. The practice of granting degrees probably originated in Paris in the second half of the 12th century. If this is the case, the University of Paris is in this sense entitled to be regarded as the oldest. (See PARIS, *University*.) At first the universities were free and self-governing corporations, in no way dependent on either Church or state. But gradually this freedom of organization was modified, owing to the increasing influence of the Church. The pope granted bulls of confirmation to the universities already in existence, and till the Reformation no new universities were erected throughout Christendom without the papal sanction. The popes also claimed the right of protecting and superintending the universities. After the Reformation the claims of the popes were, of course, no longer recognized in countries that had become Protestant. The University of Paris was a corporation of teachers, that of Bologna a corporation of students; the universities of southern Europe generally resembled Bologna in this respect, those of northern Europe resembled Paris. At first the students and teachers were organized on the basis of nationality, in groups called "nations"; and these groups were, for about a century, the only divisions in the university. A division into faculties did not arise till the 13th century. The distinction of faculties was aided by the fact that Honorius III., who feared that the general interest in legal studies would extinguish theology at Paris, forbade, in 1219, priests and regulars to read civil law. Thus the faculties of theology, arts, law, and medicine became gradually differentiated. In the 13th and following centuries endowed colleges were established at Paris and the English universities for the reception of poor scholars, some of whom received also pecuniary assistance from the foundation. Both in Paris and in England it became customary for all the students of the university to reside in colleges, and gradually also the colleges almost entirely superseded the universities in the work of teaching. Students who had degrees conferred upon them were thereby entitled to teach; bachelors, or *baccalaurei*, under the supervision of a fully-qualified teacher, and masters, or doctors (*magistri, doctores*), independently.

Numerous universities have been established in the different nations of Europe since the 12th century, a list of which will be found in the following table from the United States Education Report:

FOREIGN UNIVERSITIES ARRANGED ACCORDING TO AGE.

Date of foundation	Locality
	Tenth century
988	Cairo, Egypt.
	Twelfth century
1119	Bologna, Italy.
1181	Montpellier, France.
1200	Paris, France.
1200	Oxford, England.
	Thirteenth century
1209	Valencia, Spain.
1222	Padua, Italy.
1224	Naples, Italy.
1233	Toulouse, France.
1243	Salamanca, Spain.
1257	Cambridge, England.
1266	Perugia, Italy.
1288	Coimbra, Portugal.
	Fourteenth century
1303	Rome, Italy.
1339	Grenoble, France.
1343	Pisa, Italy.
1346	Valladolid, Spain.
1348	Prague, Bohemia, Austria.
1349	Florence, Italy.
1361	Pavia, Italy.
1364	Krakow, Galicia, Austria.
1365	Vienna, Austria.
1367	Fünfkirchen, Hungary.
1386	Heidelberg, Baden, Germany.
1391	Ferrara, Italy.
	Fifteenth century
1402	Würzburg, Bavaria, Germany.
1409	Leipsic, Saxony, Germany.
1409	Aix, France.
1411	St. Andrews, Scotland.
1412	Turin, Italy.
1419	Rostock, Mecklenburg, Germany.
1422	Parma, Italy.
1422	Besançon, France.
1426	Louvain, Belgium.
1431	Poitiers, France.
1437	Caen, France.
1441	Bordeaux, France.
1444	Catania, Sicily, Italy.
1450	Barcelona, Spain.
1451	Glasgow, Scotland.
1456	Greifswald, Prussia, Germany.
1457	Freiburg, Baden, Germany.
1460	Basel, Switzerland.
1463	Nantes, France.
1465	Budapest, Hungary.
1472	Munich, Bavaria, Germany.
1474	Saragossa, Spain.
1477	Upsala, Sweden.
1477	Tübingen, Würtemberg, Germany.
1478	Copenhagen, Denmark.
1494	Aberdeen, Scotland.
	Sixteenth century
1501	Valencia, Spain.
1502	Halle-Wittenberg, Prussia, Germany.
1502	Seville, Spain.
1504	Santiago, Spain.
1506	Breslau, Prussia, Germany (1702).
1508	Madrid, Spain.
1527	Marburg, Prussia, Germany.
1531	Granada, Spain.
1531	Sarospatak, Hungary.
1537	Lausanne, Switzerland.
1540	Macerata, Italy.
1544	Königsberg, Prussia, Germany.
1548	Messina, Sicily, Italy.
1549	Debreczin, Hungary, Theological College.
1556	Sassari, Italy.
1558	Jena, Thuringia, Germany.
1559	Geneva, Switzerland.
1566	Olmütz, Moravia, Austria.
1567	Strasburg, Alsace, Germany.
1568	Braunsberg, Prussia, Germany.
1572	Nancy, France.
1575	Leyden, Netherlands.
1580	Oviedo, Spain.
1582	Rome, Italy (Pontif.).
1583	Edinburgh, Scotland.
1586	Gratz, Styria, Austria.
1591	Dublin, Ireland.
1596	Cagliari, Italy.
	Seventeenth century
1605	Manila, Philippine Islands.
1607	Giessen, Hesse, Germany.

Date of foundation	Locality
1614	Groningen, Netherlands.
1632	Salzburg, Austria.
1632	Amsterdam, Netherlands.
1632	Dorpat, Russia.
1636	Utrecht, Netherlands.
1640	Helsingfors, Finland, Russia.
1647	Bamberg, Bavaria, Germany.
1657	Kaschau, Hungary.
1665	Kiel, Prussia, Germany.
1666	Lund, Sweden.
1671	Urbino, Italy.
1673	Innspruck, Tyrol, Austria.
1676	Eperies, Hungary.
1683	Modena, Italy.
	Eighteenth century
1710	Barbados (Codrington College), West Indies.
1721	Habana, Cuba.
1722	Dijon, France.
1727	Camerino, Italy.
1737	Ratisbon, Germany, Theological Lyceum.
1737	Göttingen, Prussia, Germany.
1740	Erlau, Hungary.
1743	Erlangen, Bavaria, Germany.
1743	Santiago, Chile.
1748	Cadiz, Spain.
1755	Moscow, Russia.
1771	Münster, Prussia, Germany.
1777	Siena, Italy.
1779	Palermo, Sicily, Italy.
1784	Lemberg, Galicia, Austria.
1785	Pressburg, Hungary.
1788	Grosswardein, Hungary.
1798	Kazan, Russia, Theological College.
	Nineteenth century
1800	Edinburgh, Scotland, Medical College.
1804	Kazan, Russia.
1804	Kbarov, Russia.
1805	Yaroslavl, Russia.
1808	Clermont, France.
1808	Lille, France.
1808	Lyon, France.
1808	Rennes, France.
1809	Berlin, Prussia, Germany.
1811	Christiania, Norway.
1812	Genoa, Italy.
1815	Moscow, Russia.
1816	Ghent, Belgium.
1816	Warsaw, Poland, Russia.
1817	Liège (Lüttich), Belgium.
1818	Bonn, Prussia, Germany.
1819	St. Petersburg, Russia.
1820	Nezin, Russia, Philological School.
1821	Halifax, Canada.
1821	Montreal, Canada.
1826	London (University College), England.
1827	Toronto, Canada.
1827	Sheffield Medical College, England.
1828	Lampeter (St. David's College), Wales.
1832	Durham, England.
1832	Zurich, Switzerland.
1832	Kiev, Russia.
1834	Freising, Germany, Theological Lyceum.
1834	Brussels, Belgium.
1834	Bern, Switzerland.
1836	London (University), England.
1837	Athens, Greece.
1838	Messina, Italy.
1840	Kingston, Canada.
1843	Eichstätt, Germany, Theological Lyceum.
1845	Cork, Ireland.
1845	Belfast, Ireland.
1845	Galway, Ireland.
1849	Algiers, Algeria.
1850	Sydney, Australia.
1851	Manchester (Victoria University), England.
1851	Newcastle, England.
1853	Melbourne, Victoria, Australia.
1857	Calcutta, India.
1857	Madras, India.
1857	Bombay, India.
1858	Lisbon, Portugal.
1860	Jassy, Rumania.
1862	Kecskemet, Hungary.
1864	Bucharest, Rumania.
1865	Odessa, Russia.
1866	Neuchâtel, Switzerland.
1868	Tokyo, Japan.
1870	New Zealand, New Zealand.
1872	Aberystwith, Wales.
1872	Adelaide, Australia.
1872	Klausenburg, Hungary.
1873	Cape Town, South Africa.
1874	Agram, Croatia, Hungary.
1875	Angers, France.
1875	Lille (Faculté Libre), France.
1875	Lyon (Faculté Libre), France.
1875	Czernowitz, Bukowina, Austria.
1875	Birmingham, England.
1876	Bristol, England.
1876	Montevideo, Uruguay.
1876	Montreal, Canada, Université Laval de Quebec.
1877	Leeds, England.
1877	Liverpool, England.
1878	Stockholm, Sweden.
1879	Sheffield (Firth College), England.
1880	Amsterdam, Netherlands, Free University.
1880	Dublin, University of Ireland.
1880	Dundee, Scotland.
1880	Nottingham, England.
1882	Prague (Bohemian University), Austria.
1882	Lahore, India.
1883	Cardiff, Wales.
1884	Bangor, Wales.
1885	Odessa, Russia.
1887	Allahabad, India.
1888	Tomsk, Siberia, Russia.
1888	Sophia, Bulgaria.
1889	Freiburg, Switzerland.
1891	Gottenborg, Sweden.
1892	Bello Horisonte, Brazil.
1897	Kyoto, Japan.
1901	Cologne, Prussia, Germany.
1901	Frankfort, Prussia, Germany.
	Date not known
	Belgrade, Servia.
	Limoges, France.
	Marseilles, France.
	Montauban, France.
	Cordoba, Argentina.
	Buenos Ayres, Argentina.

The usual university organization includes the four faculties, of philosophy (or arts), law, medicine, and theology; with the development of scientific study, a number of universities have also added scientific schools or faculties. The leading universities of Austria are Czernowitz, Gratz, Innspruck, Krakow, Lemberg, Olmütz, Prague (Bohemian), Prague (German), Salzburg, and Vienna; of these Czernovitz and Lemberg have no medical faculties and Olmütz and Salzburg have only theological faculties.

In France the leading universities are those of Aix, Algiers, Angers, Besançon, Bordeaux, Caen, Clermont, Dijon, Grenoble, Lille, Limoges, Lyon, Marseilles, Montauban, Montpellier, Nancy, Nantes, Paris, Poitiers, Rennes, Toulouse, and four separate medical schools; of these Aix has neither medical nor theological faculties; Algiers, Bordeaux, Montauban, Montpellier, and Toulouse have a scientific, but no theological faculty; Angers and Lyon a scientific, but no medical faculty; Besançon has a scientific but no theological or law faculty; Caen, Dijon, Grenoble, Poitiers, and Rennes have a scientific but no medical or theological faculty; Clermont has scientific and philosophical faculties only; Lille has a scientific faculty in addition to the other four; Limoges is a medical school; Marseilles has a scientific, but neither philosophical nor theological faculty; Nancy has a scientific faculty and pharmaceutical school, but no theological faculty; Paris in addition to the four usual faculties, has a scientific faculty, and schools of engineering and pharmacy. These universities are federated more closely than in other nations in an institution known as the University of France, having a general control of the educational system of the nation. (See also FRANCE, *Education.*)

In Germany the universities of importance include those of Bamberg, Berlin, Bonn, Braunsberg, Breslau, Cologne, Dillingen, Eichstätt, Erlangen, Frankfort, Freiburg, Freising, Giessen, Göttingen, Greifswald, Halle, Heidelberg, Jena, Kiel, Königsberg, Leipsic, Marburg, Munich, Münster, Ratisbon, Rostock, Strasburg, Tübingen, Würzburg; of these Bamberg, Braunsberg, Eichstätt, Freising, and Münster have only theological and philosophical faculties; Berlin has, in addition to the four regular faculties, a seminary of Oriental languages, and other seminaries; Cologne is a commercial university; Freiburg has no medical faculty; Heidelberg, Marburg, Strasburg, and Tübingen have scientific faculties in addition to the four regular faculties.

In Russia the leading universities are those of Kharkov, Dorpat, Helsingfors, Yaroslavl, Kazan, Kiev, Moscow, Nezin, Odessa, Saint Petersburg, Warsaw; of these Kharkov, Kazan, Moscow, and Warsaw have a scientific, but no theological faculty; Kiev has no theological faculty; Odessa, a scientific faculty, but no medical or theological faculty; Saint Petersburg, scientific faculty and a faculty of Oriental languages, but neither medical nor theological faculty.

The leading universities of Italy are those of Bologna, Cagliari, Camerino, Catania, Ferrara, Florence, Genoa, Macerata, Messina, Modena, Naples, Padua, Palermo, Parma, Pavia, Perugia, Pisa, Rome, Sassari, Siena, Turin, and Urbino; of these none have theological faculties, the majority have the three other faculties; also, Bologna has scientific and pharmaceutical faculties, and veterinary and engineering schools; Cagliari, Ferrara, and Sassari have a scientific, but no philosophical faculty; Camerino has a pharmaceutical faculty and veterinary school, but no philosophical faculty; Catania, a scientific faculty; Florence has scientific and pharmaceutical faculties, but no law faculty; Genoa and Rome have scientific faculties and schools of engineering and pharmacy; Messina, scientific and pharmaceutical faculties; Modena, scientific and pharmaceutical faculties, but no philosophical faculty; Naples, mathematical and scientific faculties and a school of pharmacy; Padua and Palermo have a scientific faculty and schools of engineering and pharmacy; Parma has a scientific faculty, and veterinary and pharmaceutical schools, but no philosophical faculty; Pavia and Turin have scientific faculties and pharmaceutical schools; Perugia has pharmaceutical and veterinary schools, but no philosophical faculty; Pisa, a scientific faculty, and engineering, pharmaceutical, veterinary, and agricultural schools; Siena, a pharmaceutical school but no philosophical faculty; Urbino, a mathematical faculty and pharmaceutical and surgical schools, but neither medical nor philosophical faculties.

The universities of Great Britain are those of Birmingham, Bristol, Cambridge, Durham, Leeds, Liverpool, London, Manchester, Newcastle, Nottingham, Oxford, Sheffield, in England; Belfast, Cork, Dublin, and Galway, in Ireland; Aberdeen, Saint Andrews, Dundee, Edinburgh, and Glasgow, in Scotland. Of these Birmingham has faculties of arts and sciences, of medicine, and of commerce; Bristol, faculties of arts and sciences and of medicine; Cambridge has schools of philology, of music, of moral science, of history, of the various sciences, and of medicine, law, and theology; London has a scientific faculty in one of the colleges included in its organization; Nottingham has philology, law, and scientific faculties, and a school of engineering; Oxford, a scientific faculty in addition to the usual faculties; Sheffield, a medical school in addition to the University College.

Scotch universities are four in number, St. Andrews, Glasgow, Edinburgh, and Aberdeen. They were decidedly mediæval in character until 1858, when they were reorganized by statute. In organization and administration they resemble the Continental, rather than the English, universities.

In Ireland the chief university is Dublin, commonly known as Trinity College, Dublin. The Royal University, which is largely an examining body, similar to the University of London, comprises likewise the Queen's Colleges of Belfast, Cork, and Galway. The Catholic University is at Dublin.

The Spanish universities, nine in number, are at Barcelona, Granada, Madrid, Santiago, Saragossa, Seville, Valladolid, and Valencia. There is a medical faculty at Cadiz and a law faculty at Oviedo. The most important is Madrid. It cannot be said that most of them are in a flourishing condition.

Portugal has one university, located at Coimbra. It has faculty of law, mathematics, medicine, philosophy, and theology, and a school of design.

After the Greek war for independence, King Otho established the University of Athens, in 1837. It was planned closely after the universities of Germany. The king, with whom resided appointive power, also selected chiefly Germans to compose the faculty. Since 1882 the power of appointment has been vested in the faculties. The universities has the four faculties of law, medicine, philosophy, and theology customary in German universities.

The Dutch universities are those of Amsterdam, Groningen, Leyden, and Utrecht, all directed by the state. The general organization and *modus operandi* of these institutions are largely similar to those of the German universities. Their organization is wholly uniform throughout, and there are, therefore, no such distinctive features, peculiar to individual institutions, such as may be found in Germany. Originally these institutions were intended as training-schools for the clergy, subsequent to the Reformation.

In Belgium are four universities. That at Brussels is a free institution; those at Ghent and Louvain are directed by the state, largely in the Dutch manner; and that of Louvain is under Roman Catholic control.

The universities of Sweden and Norway are as follows: In Sweden, Lund and Upsala; in Norway, Christiania. There are, further, a medical faculty at Stockholm, and philosophical faculties (private) at Göteborg and Stockholm. They are designed after the familiar German pattern, are closely united with the national Church, and are decidedly Lutheran in tone. There is a Danish university at Copenhagen.

There are Australian universities at Adelaide, Melbourne, and Sidney, the last named being connected with the University of London.

At Belfast is a school of mines connected with with the University of Melbourne.

The Canadian universities are at Montreal and Toronto. There further exist in Canada 24 institutions entitled to give degrees, these being, in the main, of a denominational character.

For the organization and history of the American universities, see AMERICAN UNIVERSITY, THE. For other institutions of higher learning, not properly universities, see COLLEGES; COLLEGE, THE AMERICAN; TECHNOLOGY, SCHOOLS OF; MEDICAL EDUCATION; etc.

University, American. See AMERICAN UNIVERSITY.

University, National. See NATIONAL UNIVERSITY, THE.

University of Chicago, located at Chicago, Ill. A Baptist institution known as the University of Chicago was founded in 1857, and was compelled to close its work in 1886. Shortly after the closing of that institution, a movement for the founding of a larger university was begun by the American Baptist Education Society at the suggestion of John D. Rockefeller (q.v.). The present university was chartered in 1890, and opened to students in 1892; Mr. Rockefeller contributed the larger part of the original endowment fund to which he has since added gifts amounting to over $10,500,000. The university was organized under the leadership of William R. Harper (q.v.), who has since been its president, and has largely directed and controlled its administrative and educational policy. In accordance with the charter, the president and two thirds of the trustees must be members of a Baptist Church, but there is no denominational control.

The university includes the following departments: (1) the Schools, Colleges, and Academies; (2) the University Extension Division; (3) the University Libraries, Laboratories, and Museums; (4) the University Press; (5) the University Affiliated Schools. The Schools, Colleges, and Academies include: (1) the Schools, which are the Divinity School, the Ogden (Graduate) School of Science, the School of Education, the Law School, and the Medical School (partly organized); the School of Technology, the School of Fine Arts, and the School of Music are yet to be established; (2) the Colleges, the College of Arts, the College of Literature, the College of Science, the College of Commerce and Administration, and the University College; (3) the Academies, including the Morgan Park Academy for Boys and the University High School, directly under University control, and numerous other secondary schools affiliated with the University. The University Affiliated Schools include both academies and colleges which have been affiliated with the University, their students and graduates having special privileges at the University. Each College is divided into a Junior College and a Senior College, the former including the first half of the curriculum, corresponding to the work of the usual college Freshmen and Sophomore years, the latter the work of the Junior and Senior years. The academic year for all departments is divided into four quarters of twelve weeks, and each quarter into two terms of six weeks each; the courses are arranged with the work of twelve weeks or six weeks as a unit, and students may enter upon their work at the beginning of any quarter, and may be absent from the university during any quarter they desire. The summer quarter has a large attendance of teachers, and others outside the regular student body, but an increasing number of regular students continue their work in the summer. Instructors from other universities are added to the staff for this quarter. The courses are classified as majors and minors, a major course requiring four to five hours of class room work for twelve weeks, a minor four to five hours class room work for six weeks; the regular work of a student during each term of a quarter is three minors or the equivalent. The Colleges of Arts, Literature and Science confer the degree of A.B., Ph.B., and S.B. for the completion of the full work of the Junior and Senior Colleges; the College of Commerce confers the degree of Ph.B. The work of the Junior Colleges is largely prescribed for each degree; the work of the Senior Colleges of Arts, Literature and Science is elective, with the limitation that the student may not elect more than half his work from any one department; the electives are further limited by the degree to be received. The work of the Senior College of the College of Commerce and Administration is divided into four groups: (1) Banking; (2) Transportation; (3) Trade and Industry; (4) Journalism, one of which must be elected. The University College is conducted by the university in the centre of the city, and is designed chiefly for the benefit of teachers. It confers the degrees of A.B., Ph.B., and S.B., on the fulfilment of the requirements for the degrees in the other colleges. The Divinity School includes: (1) the Graduate Divinity School, for college graduates; (2) the English Theological Seminary; (3) the Dano-Norwegian Theological Seminary; (4) the Swedish Theological Seminary. The Graduate Divinity School offers courses leading to the degrees of B.D., A.M., and Ph.D.; certain studies are prescribed for all courses; the others are elective, depending upon the degree to be obtained. The English Theological Seminary offers resident courses in the summer quarter, and non-resident courses during the other quarters; the course covers four years' work. The Graduate School of Arts and Literature and the Ogden School of Science confer the degrees of A.M., M.S., Ph.M., and Ph.D. The Law School was organized in 1902; it requires for admission the equivalent of three years of college work, and confers the bachelor's degree (A.B., Ph.B., or S.B.) after one year's work in the Law School; the degree of Doctor of Laws (J.D.) is conferred on the completion of the full course (three years); special students who maintain a high standing are granted the degree of LL.B. The Medical School offers the courses of the first two years of the medical curriculum only; Rush Medical College (q.v.) is affiliated with the university and provides a full medical course. The School of Education offers courses for the training of teachers which lead to the degrees of A.B., Ph.B., S.B., or Ed.B. (Bachelor of Education). The University Extension Division offers university extension lecture courses and corresponding courses, which entitle the student completing them to university credit; for fuller description of these courses see the article on

University Extension. This department also sends out libraries to supplement the work of the lectures and courses; and carries on work for the promotion of better library facilities in general. The University Library comprises the general library, departmental libraries, the branch libraries, and the traveling libraries of the University Extension Division. The Yerkes Observatory, founded in 1892, is located on Lake Geneva, Wis., near the town of Williams Bay; it contains a refracting telescope of 40 inches aperture, and offers special facilities for advanced work in astronomy.

Women are admitted to all departments of the university, but those who enter the Divinity School are not expected nor encouraged to take up the work of public preaching. The students maintain a Men's Club, a Woman's Union, Greek letter fraternities, a Dramatic Club, a Glee Club, an Athletic Association, and numerous smaller societies and clubs. Some of the students, nearly one third, live in the university dormitories on the campus; a few live in their fraternity houses; but the greater part live in the city and its suburbs. All students are required to wear the academic cap and gown on formal occasions. The university campus lies between Washington and Jackson Parks, facing the Midway Plaisance on the south. The buildings, of which there are 20, are built of Indiana limestone, all in the same general style of architecture, an English Gothic; they are grouped in accordance with a fixed plan, which is not yet worked out to completion, but allows for numerous additions. The library in 1904 contained 367,442 volumes; the students (on the basis of nine months' attendance) numbered 2,938; the whole number, including those who received instruction for any period, numbered 4,463; and the faculty 347.

Though the University of Chicago is the youngest of the large universities of the United States, it has taken a leading position. Its standards of scholarship are the highest, and it carries out the true university ideal, offering the best of opportunities for graduate and research work, and emphasizing that part of its work. Its policy is in many ways unique, notably in the establishment of the summer term, in its system of affiliated institutions, and in the important place given to university extension. Two other characteristics of the university are the quarter system, which permits a student to take his work when it is most convenient for him and saves him from losing a year because of some enforced absence for a few weeks, and the maintenance of a large enough force of instructors to keep the classes small, thus insuring students individual attention. Through these affiliations it has exerted a wide influence on the educational institutions of the Middle West, particularly; and through its University Extension Department it has come into close touch with the general public and the work of "popular education."

William Rainey Harper,
Late President University of Chicago.

University of Cincinnati. See Cincinnati, University of.

University Club, The, an organization of New York, incorporated in 1865. Members are required to hold a university or college degree representing a course of not less than three years of study; or an honorary degree, in the case of distinguished personages. Graduates of the United States military and naval academies are also eligible. In 1903 the membership was 3,278, the limit being 3,500 — 2,000 resident and 1,500 non-resident and of the army or navy.

University College, the specific title of an institution attached to various British universities. (1) University College, Oxford, the oldest in the university, founded through the munificence of a bequest of William, archdeacon of Durham after 1249, the exact date being unknown, consists at the present time of a master, nine ordinary fellows, one civil law fellow, 15 scholars, and 14 exhibitioners. The fellowships are held for seven years, but may be extended under certain conditions. The scholarships ($400 per annum) are open to all who have not exceeded 19 years of age. There are seven church livings in the gift of this college. The earliest statutes of the college date from 1280. (2) University College, London, founded 1828, is closely connected with London University. (3) The name is given especially to three of the four colleges which form a Welsh University, namely, the University College of Wales at Aberystwith, University College of South Wales at Cardiff, and the University College of North Wales at Bangor. The students of these colleges, proceeding to degrees, have to go through a course at either London, Dublin, Edinburgh, or Glasgow. (4) University College, Dundee, Scotland, founded in 1882, is affiliated with Saint Andrews University.

University Costume, the cap and gown worn by graduates and undergraduates of colleges and universities, indicating their academic rank. The custom of wearing special academic costume originated in the Middle Ages, when doctors and bachelors of divinity and all graduates of the universities above the rank of bachelor in other departments wore long, flowing gowns with capes or hoods; those having the highest rank also wore round caps, with a point in front. Later, undergraduates were also entitled to wear the gown; distinctions in gowns of different ranks and faculties did not become common until the 15th century; then the bachelors' gowns were made shorter than the masters'; hoods for bachelors of arts were usually bordered with white, and numerous differences in form and color distinguished graduates of higher rank. The types of caps and gowns now in use at the University of Oxford have been worn by both graduates and undergraduates since the beginning of the 17th century, and the universities of Great Britain have largely followed the customs of Oxford. The gowns of Oxford are of two types: (1) those worn by all graduates in divinity and arts and by all members on the foundation of any college, with loose sleeves, without collars, and gathered in small plaits at the back; (2) those worn by the graduates in law and other faculties, and by undergraduates not on the foundation of any college, the gowns not so full, with falling collars and closer sleeves. The Cambridge types are about the same as Oxford for graduates; the undergraduates have a slightly different type of gown for each college. In the United States the wearing of academic costumes was at first looked upon with disfavor, but recently the custom of wearing caps and gowns has been

adopted by the leading universities and by many smaller institutions. The movement for the adoption of this costume originated in most cases with the students, but has met with encouragement from the university faculties and authorities, and in some instances has been required by them independently of student initiative, as by the University of Chicago since its opening. The wearing of the costume has been urged on the ground that it gives to university functions a more impressive and artistic appearance, and that it is essentially democratic, concealing all differences in dress and enabling the poor students to make as good a public appearance as the rich. In some institutions the cap and gown are worn by all undergraduates, the graduates and the faculty; in others by no undergraduates except the senior class; and in still others by only the graduates and faculty on specified occasions. Where undergraduates wear costume it is usually required only at special university functions; the students, however, often adopt the custom of wearing cap and gown throughout the year. As the custom of wearing caps and gowns became fixed in American colleges and universities, the desirability of some uniformity in type and colors became evident, and, on the initiative of Princeton, an intercollegiate committee was appointed, which decided upon certain rules for gowns and hoods that have been generally adopted. In accordance with these rules all gowns are to be black, the bachelor and undergraduate gowns to be made of woolen stuff, the masters' and doctors' gowns of silk. The gowns may be of different types, in accordance with the choice of the different institutions; they are, in general, loose gowns with a yoke; they may be open or closed in front, and may differ in the amount of fulness in the back and shirring below the yoke. The bachelors' gowns have long, pointed sleeves; the masters' gowns, long closed sleeves with slit for the arm to pass through near the top; the doctors' gowns, round, open sleeves. Trimmings of velvet either in black or in colors to match the hood are allowed on the doctors' gowns, only. The shape of the hoods are the same as in the University of Oxford; the bachelors' hoods are three feet in length, the masters' one foot longer, and the doctors' hoods are made with a panel. The department from which the degree is received is indicated by the color of the trimming of the hood, a band not more than six inches wide around the outer edge; the colors are as follows:

Arts and letters	white	Science	gold yellow
Theology	scarlet	Fine arts	brown
Law	purple	Music	pink
Philosophy	blue	Medicine	green

The institution from which the degree is received is indicated by the colors of the lining of the hood; where two institutions have the same colors they are distinguished by difference in color arrangement. Undergraduates wear no hoods. The cap for all ranks is the Oxford cap, with skull cap foundation and square mortar board top; the cap for the doctor's degree may be of velvet and the tassel partly or entirely of gold.

University Extension, an educational movement designed to bring the advantages of higher education within reach of all the people. As the name indicates the centre of this work is usually a university, though in some instances libraries or educational associations have taken up university extension teaching. University extension work is carried on by the following agencies: (1) Courses of lectures on some one subject delivered by university professors or others approved by the extension centre; these courses usually consist of six or twelve lectures each, given every week or every two weeks; (2) syllabi, or outline of lectures, including references for outside reading and suggestions for study, distributed to all who attend the lectures; (3) classes for discussion and question conducted by the lecturer before or after each lecture; (4) home reading and preparation of papers on subjects, suggested in the syllabi by those attending the lectures; (5) local examinations conducted by the extension centre; where a university is the centre, credit is often given for complete and satisfactory work in extension courses; (6) traveling libraries consisting of books relating to subjects of lectures sent out by the centre to communities where suitable literature could not otherwise be obtained. The best extension centres make use of all these agencies; some of the smaller centres confine themselves mostly to furnishing lectures and the syllabi. Also, a large number of people in each community who take an interest in attending the lectures, do not take part in the classes, home study, or examinations. It is the rule in extension work to charge a small fee for admission to the lectures; any community within reach of a centre may have the benefit of a course by making the necessary local arrangements and providing for the sale of tickets for the lectures. The customary method of beginning extension work in a community is for those interested to establish a simple form of local organization or local "committee," communicate with the centre with which they are most naturally allied, and select from the centre's list the course which is desired. This committee then has charge of selling tickets, providing the hall for the lectures, and arousing public interest as widely as possible. The initiative in starting a university extension course very often comes from a study club, a library, or the teachers in the community. Large cities as well as towns and villages take advantage of university extension courses. The subjects which are most popular for extension lectures are in history, literature, political economy, art, and natural science; in view of the number of teachers taking extension work, courses in pedagogy are also often given. Many communities adopt a series of related courses extending over several years; and such consecutive work is encouraged by the centres.

History.—The university extension movement is of English origin; as early as 1850 the University of Oxford entered upon the work of general education by establishing local examinations for those not its regular students; the University of Cambridge soon followed Oxford's example; and in 1873 supplemented the examinations by establishing a course of lectures, thus beginning real extension teaching. Oxford, in turn, established lecture courses in 1878, but did not do continuous work in that line until 1885, when full extension work was organized. Durham University, Victoria University, and the University of London (through its extension board) have also taken up the work

of university extension. Certificates are awarded at the end of each full course to those passing the examinations. In Oxford and Cambridge centres which provide a suitable course of instruction covering a period of several years are connected with the university as affiliated centres; students taking these courses are granted "higher" certificates, that give them credit toward the university degree. An outgrowth of the extension teaching in England is the establishment of study clubs in connection with the extension courses, and reading circles for the guidance of the student's reading between lectures. In the United States university extension work was first taken up in 1887, when the subject was publicly presented before the American Library Association; and in the same year the librarian of the Buffalo Public Library organized a course of 12 lectures on economics, with printed syllabi, classes, and a special reference library arranged in a room of the library building. This plan was afterward adopted by the librarians of Saint Louis, Chicago, and other southern and western cities, university graduates and local institutions co-operating with the libraries in extending the work. At about the same time (1887–8) individual professors at Johns Hopkins University gave lectures and conducted classes in the city of Baltimore, but this work did not come under the supervision of the University as such. In 1888 Melvil Dewey first presented the subject of the university extension before the regents of the University of the State of New York, and in 1890 a committee representing several colleges and universities urged the regents to establish a system of university extension; in 1891 the State appropriated $10,000 for the organization of university extension. The law stipulated that this grant should be used to defray the costs of organization, supervision, and printing, not for the payment of lecturers, the expenses of the lectures to be met by the local constituencies. This work of university extension in New York State has remained under the charge of the Home Education Department of the University of the State of New York, and has been successfully carried on in connection with the work of other divisions of that department (see HOME EDUCATION), though the tendency has been to pay more attention to library organization and traveling libraries. The extension centre at Albany registers as lecturers, university professors, teachers, and others qualified, arranges courses, prints syllabi, and corresponds with local committees and associations, aiding them in establishing extension courses. Traveling libraries are sent out to local centres by the traveling library division of the Home Education Department, and examinations conducted by the regents of the university are open to those taking extension courses. In 1890 the American Society for the Extension of University Teaching was organized in Philadelphia under the leadership of Dr. Pepper, provost of the University of Pennsylvania. This Society has ever since been one of the strongest influences in the spread of university extension work; it has organized courses of six lectures each; engaged competent lecturers; has co-operated in establishing extension courses with existing local institutions, libraries, clubs, etc., and has sent its lecturers to towns at considerable distances from Philadelphia in Pennsylvania and adjoining States. At the close of 1900 the society reported an average attendance of 18,000 a year at its lectures for the 10 years of its existence. In 1892 the University of Chicago was opened, and shortly after university extension was made one of the regular departments of the university. Chicago sends out traveling libraries and awards certificates for satisfactory completion of its courses; the work has met with the heartiest co-operation, especially from teachers, women's clubs, and public libraries. These three original centres are the most successful and most important centres of university extension in the United States. The State universities of the South and West have taken up the work for their States with varying degrees of completeness and success. Prominent among these is the University of Wisconsin, which in 1892 established a Department of University Extension; it has organized a complete system of extension work, conducting examinations, and awarding certificates giving certain university credit. Single lectures are provided where a full course is not practicable. Other universities, as for example the Iowa State University, do not organize full extension work, leading to university credit, but provide for courses of lectures to be given before schools and other local institutions and associations.

Other Factors in Popular Education: Correspondence Schools.—The name of university extension has been, in common usage, applied to the lecture courses above described; the real work of university extension is, however, carried on by a number of other agencies, which in the United States have proved even more successful than the work of university extension proper. Such agencies include summer schools (q.v.), public libraries (see LIBRARIES), traveling libraries (q.v.), study clubs, and correspondence schools. Correspondence schools have been organized by stock companies on a commercial basis, offering a large variety of courses in general and technical subjects; the largest and best of these schools do thorough and efficient work under the guidance of competent men, though of many of the smaller schools this cannot be said. Their charges, however, are comparatively high, few courses being offered under $30, and many costing as high as $100; these schools establish branch offices, and adopt the methods of any business house in advertising for students. This commercial side tends to separate them somewhat from the educational movement led by colleges and universities. More closely allied to the work of university extension is the correspondence work of Chautauqua (q.v.), begun in 1884, and leading in some cases to a degree, and the correspondence work which has been undertaken by a few colleges and universities. The leader in this line is Chicago, which has made its correspondence courses a part of the work of its university extension department. The unit or major course represents the amount of work done by a student in residence in 12 weeks, a half or minor course the work of six weeks; these correspondence courses cover exactly the same ground as the residence courses, and 12 of the 36 courses required for the bachelor's degree may be taken by correspondence. The regular or formal courses are conducted on the basis of printed instruction sheets and recitation papers written

by the student in answers to questions on these sheets; advanced (or informal) courses are arranged between instructor and student to suit the latter's needs. A fee is charged for each course. The Pennsylvania State College gives correspondence courses in agriculture free of charge. Baylor University at Waco, Texas, has conducted formal and informal correspondence courses since 1897, as does the State Normal Training School at Willimantic, Conn.

Consult: 'Extension Bulletins' of the New York State Home Education Department; 'Handbook of University Extension,' by James; 'Ten Years Report of the American Society for the Extension of University Teaching' (1900).

A. M. BURNHAM, A.B.,
Editorial Staff, 'Encyclopedia Americana.'

University of California. See CALIFORNIA, UNIVERSITY OF.

University of North Carolina. See NORTH CAROLINA, UNIVERSITY OF.

University of the Pacific, located at San José, Cal. It was founded at Santa Clara in 1851 under the auspices and control of the Methodist Episcopal Church; in 1871 it was moved to San José; about 40 years after its incorporation Napa College was consolidated with it, and the name of the University of the Pacific adopted. It is open to both men and women. The organization of the university includes the College of Liberal Arts, the Academy, the Department of Elocution and Oratory, the Commercial College, the Art Department, and the Conservatory of Music. The College of Liberal Arts offers four courses, the classical, the philosophical, the scientific, and the literary, for completion of which the degrees of A.B., B.Ph., B.S., and B.L. are conferred. The work of the last two years in each course is elective, a limited amount of work in certain departments being required according to the degree conferred. Four corresponding courses are given in the Academy. The Commercial College offers a commercial course, a shorthand course, and an advanced course, the last named including electives in the College of Liberal Arts, and leading to the degree of expert accountant. The Department of Elocution offers a course covering two years; the Art Department a course of three years. One tenth of the work of the B.L. course may be taken in the Art Department. The full course in the Conservatory of Music extends over four years, and leads to the degree of bachelor of music. The university is situated in the Santa Clara valley, within easy reach of both San José and Santa Clara; and occupied five buildings (1904). The library in 1904 contained 2,000 volumes; the income amounted to $23,000; the students numbered 272, and the faculty 16.

University of Rochester, located at Rochester, N. Y. The university was established by the Baptists of New York State with the aid of Rochester citizens; it was opened to students in 1850, and received its permanent charter in 1851. In 1900 it was opened to women on equal terms with men. Though it was incorporated as a university, it has never sought to do university work, but aims to give its students a thorough, liberal college course of the best type. It offers three courses, classical, philosophical, and scientific, and confers the three degrees of A.B., B.Ph., and B.S. Each course has certain prescribed studies and elective studies, the elective work beginning in the Sophomore year. In the scientific course arrangements have been made by which students taking certain electives and some technical work in the Mechanics' Institute of Rochester may enter the third year of the best technical schools. There is also a teachers' training department and a manual training normal course; graduate work is provided leading to the master's degrees. Saturday classes are arranged for the benefit of teachers. There are 118 scholarships, of which 40 are for students for the Baptist ministry, 24 for graduates of the Rochester High School, and 12 for women. The university campus comprises 24 acres situated in one of the most beautiful parts of the city; the buildings include Anderson Hall, Sibley Hall, Reynolds Memorial Laboratory (chemistry), and the Alumni Gymnasium (for the use of men students); there are no dormitories; many students live in the chapter-houses of the Greek letter fraternities. The library in 1903–4 contained 40,492 volumes; the students numbered 264, of whom 72 were women.

University Settlements. See SOCIAL AND UNIVERSITY SETTLEMENTS.

University of the South, located at Sewanee, Tenn. It was chartered in 1857 by the Southern dioceses of the Protestant Episcopal Church; the site and endowment were obtained, and the central building begun, when the Civil War stopped further operations and rendered the endowment worthless. In 1867 more funds were obtained largely through the efforts of Bishop Quintard of Tennessee, and the Grammar School (secondary grade) and Academic Department (collegiate grade) opened to students in 1868. The university now includes the Grammar School, the Academic Department, the Theological Department organized in 1878, the Medical Department established in 1892, and the Law Department established in 1893, the School of Pharmacy established in 1904, and a Training School for Nurses, connected with the Medical and Pharmaceutical departments. The Academic Department offers five groups of studies leading to the degree of A.B., and one course in civil engineering leading to the degree of C.E. The degree of A.M. is conferred for graduate work. In the Theological Department the degree of Graduate in Divinity is conferred on all who complete the regular three years' course (including Greek and Hebrew); post-graduate work and a thesis entitles those who have the A.B. degree to the degree of B.D. The Law Department has a course of two years, for completion of which the degree of LL.B. is conferred. The Medical Department offers a four years' course leading to the degree of M.D. The course in both the School of Pharmacy and the Training School for Nurses is two years in length. Six scholarships are available for students in the Theological Department, and about 20 for students in the Academic Department. Full provision is made for physical training, and there is a general interest in athletic sports which are under the control of the Students' Athletic Association. Seven Greek letter fraternities are represented at the university, and the students also maintain two literary societies, musical clubs, and a

dramatic club. The university controls a domain of nearly 10,000 acres in the midst of the beautiful scenery of the Cumberland Plateau; a reservation of 1,000 acres surrounds the central buildings, from which building lots are leased for long terms. The chief buildings are Saint Luke's Memorial Hall (Theological Department), Walsh Memorial Hall, the Library with a tower modeled upon that of Magdalen College Chapel, Oxford, in which are a clock and peal of bells, Thompson Hall (Medical Department), Hodgson Memorial Infirmary, Hoffman Memorial Hall (dormitory), Quintard Memorial Hall (Grammar School), the Chapel, and Forensic Hall; a new gymnasium was in process of erection in 1904. The library in 1904 contained 23,330 volumes; the students in all departments numbered 467, and the faculty 45.

University of Southern California, The, located at Los Angeles. It was established in 1879 under the auspices of the Methodist Episcopal Church, and first opened to students in 1880. Men and women are admitted on equal terms. The university organization includes the College of Liberal Arts, the College of Medicine, the College of Law, the College of Dentistry, the College of Music, the College of Art, the Preparatory School, and the Commercial Department. The College of Liberal Arts offers three courses, the classical, the philosophical, and the scientific, leading to the three degrees of A.B., B.Ph., and B.S. Each course includes some required studies, and some electives, among which must be a major subject in one department; the electives are first offered in the Sophomore year. Bible study is a part of the curriculum, but is entirely elective. The degrees of A.M. and M.S. are conferred for graduate work. The College of Medicine offers a course of four years, leading to the degree of M.D.; and the College of Dentistry also a four years' course, leading to the degree of D.D.S. The College of Law was established in 1897 as the Los Angeles College of Law, and was later affiliated with the university; it has a course of two years, and confers the LL.B. degree; in 1903 new courses were added and lectures on special topics provided, such as mining law, patents, banking customs, etc. The College of Music has three general departments, preparatory, normal, and collegiate; special attention is given to the study of the pipe organ. The Commercial Department offers a commercial course, a shorthand course, a penmanship course, and a course in use of the typewriter. The university campus comprises 10 acres, three miles and a half from the main part of the city; the buildings include the main building and the buildings of the College of Music, and the Preparatory School, the colleges of Medicine, Dentistry, and Law have more central locations within the city; the College of Fine Arts has a building and grounds of its own at Gavanza, one of the suburbs of Los Angeles. The library contains 2,500 volumes; the Los Angeles County Law Library is also open to the students of the College of Law. The students in 1904 numbered 636, the faculty 110.

University of the State of New York. For an account of the history and work of the university, see NEW YORK STATE UNIVERSITY. A reorganization of the New York State educational system was effected in March 1904, in accordance with which the board of regents consists of 11 members, elected by the legislature, as far as possible one from each judicial district. The members of the board first elected under the new law were chosen from the former board of regents for a term of one, two, three, four, five, six, seven, eight, nine, ten, and eleven years respectively; their successors will be elected for the full term of 11 years. The office of secretary of the board of regents is abolished, and the duties of the office conferred upon a new officer, the commissioner of education, who also performs the duties of the former superintendent of public instruction; the commissioner of education first elected is chosen by the legislature for a term of six years; his successor is to be appointed by the board of regents and to serve during the pleasure of the board. The supervision of elementary and secondary schools, including all schools except colleges, technical, and professional schools, is devolved upon the commissioner. Thus the regents of the university lose their direct control over secondary schools, but gain the power of appointing the commissioner who has supervision of all schools, while his appointments in all departments are also subject to their approval; they also have power to establish such regulations as are necessary to carry out State laws relating to education. All their other powers are the same as formerly. The purpose of the law is to unify the educational system, control of which was formerly divided between the regents and the superintendent of public instruction. The commissioner of education has established the following departments: law; examinations; inspections; accounts; printing and publications; statistics and apportionments; normal schools, training classes and institutes; libraries; scientific work and museums. In these departments the work of the regents and the former Department of Public Instruction is united; the new libraries department associates school libraries, home education, and the Library School with the State Library.

University of Wooster, located at Wooster, Ohio. It was founded under the auspices of the Presbyterian Church, was chartered in 1866, and first opened to students in 1870. In 1899 the charter was revised, and the power of electing the members of the board of trustees delegated to the Presbyterian Synod of Ohio. Previously the board was self-perpetuating. The organization of the university now consists of the Collegiate Department, the Preparatory Department (organized 1872), the Conservatory of Music (established 1882), the School of Art (established 1895), the Bible and Missionary Training School (established 1903), and the Summer School (organized in 1876, reorganized in 1895). All departments are open to women. The Collegiate Department offers three courses, the classical, the philosophical, and the scientific, leading to the degrees of A.B., Ph.B., and B.S.; the elective system prevails in the Junior and Senior years of all courses; in the scientific course three electives must be in science. Some of the electives may be taken in the Music and Art departments. Students in the Music and Art departments may also elect courses in French, German, or English in the Collegiate Department. The Bible and Missionary Training School offers two courses, a three years' course, the central feature of which

is Bible study, and a one year's course especially for training in practical religious and philanthropic work. The school is designed for the training of missionaries, pastor's assistants, Sunday school teachers, etc. Those who have the A.B. degree may obtain the degree of A.M. in connection with the work of this school. The Summer School offers about 100 courses, including teachers' training courses, courses in music, art, bookkeeping, and the subjects of the general college curriculum; it is largely attended by teachers. The university has a campus of 32 acres, on a hill overlooking the city; the buildings include Kauke Hall (the main building), Severance Hall (departments of chemistry and physics), Scovel Hall (departments of geology and biology), Taylor Hall (preparatory department), the Library, the Chapel, Hoover Cottage (the women's dormitory), the Kauke Conservatory of Music, the Observatory, and the Gymnasium. The library in 1904 contained 26,000 volumes; the students including the Summer School numbered 882, of whom 257 were in the Collegiate Department, 208 in the Preparatory Department, and 446 in the Summer School. The spirit of the university is strongly religious, over 40 per cent of the men graduates being ministers or missionaries.

Unleavened Bread, bread made without leaven or ferment, and prescribed in the Jewish law (Ex. xii. 15, 17) to be used at the Passover festival; it is required in the Latin Church as one of the two eucharistic elements. The Authorized Version of Ex. xii. has "And ye shall observe *the feast of unleavened bread*," and from this it has been inferred that this feast is not identical with the Passover; but the words in italics are confessedly interpolated by the translators, and they appear to be the only ground for the inference: the Septuagint version has no such interpolation, but neither has it the term (*azyma*) for unleavened bread; it renders the passage, "And ye shall observe this command." In the Eucharist the Oriental Churches, as the Greek Orthodox, the Nestorian, and the rest, including the Oriental Churches in communion with Rome except the Maronites and the United Armenians, use leavened bread for the Eucharist: in churches of Latin rite unleavened bread alone is permitted. The Council of Florence (1439), in the Decree of Union, defined that consecration either in leavened or unleavened bread is valid. The usage of the Protestant churches conforms with that of the Oriental Church.

Unterwalden, oon'tĕr-väl-dĕn, Switzerland, one of the smaller cantons, in the centre of Switzerland, bounded on the north by the Vierwaldstätter Lake, on the east by mountains which separate it from Uri, on the south by Bern, and on the west by Lucerne. The pasturage of cattle is the chief support of the inhabitants, and there is a considerable trade in agricultural produce and in wood. The surface is mountainous; the most remarkable summits are those of Pilatus and of Titlis. The canton is divided into two valleys, Upper and Lower (Obwalden and Nidwalden), by a forest called Kernwald, which crosses it from north to south. Each of these valleys forms an independent state, but is represented by only one member in the council of the Swiss states, instead of two, as all the whole cantons are. The chief town of Obwalden is Sarnen, and of Nidwalden, Stanz. Area of Obwalden, 183 square miles; pop. (1900) 15,280; area of Nidwalden, 112 square miles; pop. (1900) 13,088.

Un'thank, James Bryant, American college president: b. Williamsburg, Ind., 1849. He was graduated from Earlham College, Richmond Ind., in 1874, was professor of history and logic 1874–81, and has been president of Wilmington College, Ohio, from 1881.

Un'win, William Cawthorn, English civil engineer: b. Coggeshall, Essex, 12 Dec. 1838. He was educated at the City of London School, and was instructor at the Royal School of Naval Architecture and Marine Engineering, Kensington, 1868–72. Since 1885 he has been professor of engineering at the Central Technical College of the Guilds of London, Kensington. He has published 'Wrought Iron Bridges and Roofs' (1869); 'Machine Design' (1877); 'The Testing of Materials of Construction' (1888); 'The Life of Hirn' (1896); etc.

Unyoro, oo-nyō'rō, British East Africa, a former native state bordering on the Albert Nyanza, and now included in Uganda. Pop. estimated at 1,500,000.

Up From Slavery, an autobiography by Booker T. Washington (q.v.), published in 1901. Its author was a slave until freed by the Emancipation Proclamation. The story of his career is told with much grace and simplicity as well as extreme modesty.

Upanishads, oo-pă-nĭ-shădz', a series of speculative treatises belonging to the Vedic literature. They are 108 in number and contain the mystical doctrine of the Hindus regarding the human soul, the nature of deity, and the process of creation. They constitute part of the Brahmanas or commentaries belonging to the Veda and present the Vedic doctrine in a comprehensive form. Though not supposed by Hindus to have been revealed in the same manner as the Vedic hymns, the Upanishads are not assigned to human authorship, but are deemed inspired writings. (See SANSKRIT.) There is an English translation of the Upanishads by Max Müller, 2 vols.

U'pas Tree, a Javanese tree (*Antiaris toxicaria*), celebrated for its poisonous qualities, which, however, have been very much exaggerated. It was long believed in Europe that this tree was a solitary one situated in a valley in Java, that the pestilential qualities of it were so great that neither herb nor animal could live within many miles of it, and that criminals alone were sent to gather poison from it, few of whom ever returned. The Javanese themselves dread this tree, and will not rest beneath it, or even pass to leeward of it. The upas tree belongs to the *Urticaceæ*, and the stem rises for about 60 feet before the first branch puts out. The wood itself is harmless, being used for furniture, but the bark, which is whitish, and nearly an inch thick, when wounded, exudes a viscid, milky yellowish sap, which becomes brown upon exposure and hardening into gum. From this sap, when mixed with the seeds of capsicum and other substances, a deadly arrow-poison is made, which is at first purgative and emetic in its effects, and then narcotic, finally killing the victim by tetanic convulsions. It is called upas-antiar. When the tree is felled or

the bark is much injured, the tree gives out noxious exhalations which will cause cutaneous eruptions, and if the upas tree be burned the smoke from it will produce the same result. A variety of *Antiaris* is the sack tree, formerly known as *A. innoxia.* It has a bark, pieces of which, when soaked and beaten, can be turned inside out without tearing, and, a section of the wood having been left for a bottom, can be used as a sack. It is said that a kind of coarse cloth is made from the fibrous inner bark of the upas tree, and is worn by poor people, but that if wetted it excites an intolerable itching of the wearer's skin.

Up'church, John Jorden, American mechanic: b. Franklin County, N. C., 26 March 1822; d. Steelville, Mo., 18 Jan. 1887. He gained a wide knowledge of mechanics and engineering through practical experience, engaged in constructing large saw and flour mills, was master mechanic on the Main Hill and Schuylkill Haven Railroad in 1841–54 and in 1868 entered the machine shops of the Great Western railroad at Meadville, Pa. On 27 Oct. 1868 he founded there the first lodge, consisting of 14 members, of the Ancient Order of United Workmen, a fraternal organization which has since extended into every State and Territory of the United States. He removed to Missouri in 1873, where he was engaged as master mechanic of the car-shops of the Saint Louis, Salem, and Little Rock railroad and also superintendent of the building of the shops and the purchase and erection of machinery.

Up'degraff, Milton, American astronomer: b. Decorah, Iowa, 20 Feb. 1861. He was graduated from the University of Wisconsin in 1884, was assistant astronomer at the Washburn Observatory 1884–7, and from the last named year until 1890 he held an astronomical post at the National Observatory at Cordoba, Argentine Republic. Since 1899 he has been professor of mathematics of the United States navy.

Upham, up'am, Warren, American geologist: b. Amherst, N. H., 8 March 1850. He was graduated at Dartmouth in 1871; served on the geological survey of New Hampshire 1875–8; on the geological survey of Minnesota in 1879–85; and on the United States Geological Survey in 1885–95. Since the last named date he has been secretary and librarian of the Minnesota Historical Society in Saint Paul. He has published 'The Glacial Lake Agassiz'; 'Greenland Icefields and Life in the North Atlantic, with a New Discussion of the Causes of the Ice Age' (with G. F. Wright); etc.

Up'john, Richard, American architect: b. Shaftesbury, England, 22 Jan. 1802; d. Garrisons, N. Y., 16 Aug. 1878. He emigrated to the United States in 1829 and took up his residence in New Bedford, Mass. On being appointed to direct the alterations in Trinity Church, New York, he left Boston, where he had been engaged on the designs for the Court House of that city, and settled in New York, where he drew the plans for the Trinity Church of to-day, completed in 1846 and then considered the handsomest church in the United States. He also built the Church of the Ascension, the Church of the Holy Communion, Trinity Chapel, St. Thomas' Church, and others in New York, St. Paul's Church, Buffalo, and the Church of the Pilgrims and Grace Church in Brooklyn. His civic architecture was chiefly that of Italian Renaissance, while his domestic buildings were of various styles.

Upjohn, Richard Mitchell, American architect, son of the preceding: b. Shaftesbury, England, 7 March 1828; d. Brooklyn, N. Y., 1903. He came to this country from England with his parents in his infancy and became a partner with his father when 20 years old. Among the many buildings erected with his co-operation are the Madison Square Church, the old Mechanics' Bank in Wall Street, St. Peter's Church, Albany; the Central Congregational Church, Boston; Park Church, Hartford, Conn.; St. Paul's Protestant Episcopal Church, Brooklyn, and Trinity Parish School, New York. His chief work was the State Capitol in Hartford, Conn., and he had frequently been employed as an expert on civic, State, and national commissions. He was a member of the American Institute of Architects since its foundation and was president of the New York Chapter for two years. He was also a member of the Architectural League, an officer of the Architectural Department of the Brooklyn Institute of Arts and Sciences, and a life member of the Metropolitan Museum of Art. As an architect he was possessed of rare versatility. While he exhibits in his State Capitol at Hartford a knowledge of what is meant by architectural magnificence, in other moods he has produced ecclesiastical, collegiate, and domestic structures of a sober dignity, and austerity of design which are not unworthy of the best ages of architecture.

Upland Plover, a sportsman's name for the Bartramian sandpiper. See SANDPIPERS.

Upolu (oo-pō-loo') Island. See SAMOAN ISLANDS.

Upper Alton, Ill., city, Madison County; on the Chicago, B. & Q. and the Chicago & A. R.R.'s; two miles northwest of Alton. It is in an agricultural region. There are roof-tile works, a machine shop, grist mill, and other manufactories connected with the shipping of farm products. The educational institutions are the Shurtleff College (Baptist), opened in 1827 and chartered in 1835; a high school, opened in 1885, and public elementary schools. The Shurtleff College had, in 1903, 13 professors and instructors, and 168 students. The library contained 10,000 volumes, the productive funds amounted to $143,436, and the total income to $13,864. Pop. (1890) 1,803; (1900) 2,373.

Upper Canada. See ONTARIO.

Upper Helderberg Group, a discarded term in geologic chronology, applied to the lower members of the Mid Devonic formations — the Schoharie Grit, and the Onondaga or corniferous limestone. The term was derived from the Helderberg Mountains where these rocks form the highest limestone members, while other limestones termed the Lower Helderberg group formed the basal limestone strata. To these latter, now classed as Lower Devonic, with the exception of the Manlius limestone, the name Helderbergian is now restricted. See DEVONIAN; OLD RED SANDSTONE.

Upper Iowa University, located at Fayette, Iowa. It was established as Fayette Seminary in 1857, and the name was changed to Upper Iowa University in 1858. It is supported and controlled by the Upper Iowa Conference of the

Methodist Episcopal Church. It has been open to men and women on equal terms from the first, and a third of the graduates have been women. The organization includes the College of Liberal Arts, the Academy, the Normal School, the Conservatory of Music, a school of art, the School of Oratory, the Business College, the School of Physical Culture, and the Summer School. The College of Liberal Arts offers a classical, a philosophical, and a scientific course, and confers the three degrees of A.B., B.Ph., and B.S. The courses of instruction are arranged in four groups: (1) the philosophy and history group; (2) the language group; (3) the scientific group; (4) mathematics. Certain studies are required in all courses; the rest of the work is elective, each student being required to elect a major and a minor subject, in different groups, the degree received depending upon the major subject. The full course in the Normal School is four years in length, and prepares for the State diploma; the first two years of this course prepares for a county certificate, and the first three years for a State certificate. The Business School offers a commercial course, and a course in shorthand and typewriting, each six months in length; the two may be combined in one course occupying eight months. A certain amount of work in the music, art, and oratorical departments may be elected by students in the College of Liberal Arts. The Summer School was organized in 1902 for normal work only; in 1903 general college courses were added. The university maintains one dormitory for young women, but students mostly board in private homes in the city. Much interest is manifested in athletics; inter-collegiate football has been (1904) temporarily discontinued; but match basketball and baseball games are played; the control of athletic sports is vested in a board of four representatives of the faculty, one representative from each college class, and a resident alumnus. The campus consists of 12 acres; the buildings include the Main Building, South Hall (women's dormitory), North Hall, Chapel, Gymnasium, Observatory, and the David B. Henderson Library, built by Andrew Carnegie. In 1904 the library contained over 8,000 volumes; the students numbered 527, of whom 129 were in the College of Liberal Arts, 150 in the Business College, and 144 in the Conservatory of Music.

Upper Sandus'ky, Ohio, village, county-seat of Wyandot County; on the Sandusky River, and on the Pennsylvania and the Columbus, H. V. & T. R.R.'s; about 60 miles north by west of Columbus and 57 miles south by east of Toledo. It is in an agricultural and stock-raising region. The chief manufacturing establishments are machine shops, wagon and carriage works, foundries, flour mills, and furniture works. The educational institutions are a high school, established in 1872, public and parish schools, and a public library. The two banks have a capital of $155,000, and deposits amounting to $512,000. Pop. (1890) 3,572; (1900) 3,355.

Upsala, oop-sä'lä, Sweden, a town situated on the Fyris River near the head of a navigable branch of Lake Mälar, 35 miles northwest of Stockholm. The most prominent building is the Gothic cathedral built in 1260–1435, and restored in 1886–93. It contains the tombs of several Swedish kings. The main building of the university is a fine Renaissance structure built in 1879–87. The university was founded in 1477. It has about 1,400 students, a library of 300,000 volumes and 12,500 manuscripts, large collections of coins and paintings, a botanical garden and museum, with a statue of Linnæus, and observatory, and other scientific institutions. The industries are unimportant, but there is a large annual fair. Pop. (1901) 23,802.

Upsetting Thermometer. See THERMOMETER.

Upshur, ŭp'shẽr, **Abel Parker,** American statesman: b. Northampton County, Va., 17 June 1790; d. Potomac River, near Washington, D. C., 28 Feb. 1844. He was admitted to the bar in 1810, practised law at Richmond, Va., in 1810–24, and in 1825 served in the Virginia legislature. He was appointed judge of the general court in 1826, was a member of the convention to revise the State constitution in 1829, and then resumed his office as judge, serving until 1841, when he accepted the appointment as secretary of the navy under President Tyler. On the resignation of Daniel Webster in 1843 he became secretary of state, in which capacity he favored the pro-slavery party and also supported President Tyler's policy of annexing Texas. On 28 Feb. 1844, in company with the President and his party, he visited the war steamer Princeton on the Potomac River to witness the testing of a large gun. It exploded in the experiments and Secretary Upshur, together with several others of the party, was killed.

Upshur, John Henry, American naval officer: b. Northampton County, Va., 5 Dec. 1823. He was educated at William and Mary College, entered the navy in 1841, served in the Mexican War, and participated in the capture of Vera Cruz. He was graduated from the Naval Academy at Annapolis, Md., in 1848, accompanied the Perry expedition to Japan in 1854, and in 1857–9 was flag-lieutenant on the African squadron. He was an instructor at the Naval Academy at the beginning of the Civil War and was assigned to the South Atlantic squadron with which he remained until 1862. He was then transferred to the North Atlantic squadron, was present at the engagements of Forts Royal and Hatteras and participated in the capture of Fort Fisher in 1865. He received promotion to commander in 1866, captain in 1872, commodore in 1880, was in command of the New York Navy Yard in 1882–4, and in the latter year was made rear-admiral in command of the naval forces of the Pacific. He was retired in 1885 at his own request.

Up'son, Anson Judd, American educator: b. Philadelphia, Pa., 7 Nov. 1823; d. Glens Falls, N. Y., 15 June 1902. He was graduated from Hamilton College, Clinton, N. Y., in 1843, and taught there until 1870, occupying the chair of logic and rhetoric in 1853–70. He was ordained in the Presbyterian ministry in 1868, and in 1870–80 was pastor of the Second Presbyterian Church at Troy, N. Y. In 1880 he was appointed to the chair of sacred rhetoric at Auburn Theological Seminary, in which office he remained until 1887, became vice-chancellor of the University of the State of New York in 1890, and from 1892 until his death was chancellor. He published: 'Inquiry into the Nature and Character of our Federal Government' (1840).

Upton, Emory, American soldier: b. Batavia, N. Y., 27 Aug. 1839; d. San Francisco, Cal., 14 March 1881. He was graduated at West Point in 1861, and was commissioned second lieutenant in the 4th artillery; and a few days later was promoted first lieutenant of the 5th artillery. While serving on the staff of Gen. Tyler he participated in the first battle of Bull Run, where he was wounded, and in the Peninsula and Maryland campaigns of 1862 (qq.v.). In October 1862 he was commissioned colonel of the 121st New York volunteers. He fought at Fredericksburg, and from Gettysburg to the Wilderness commanded a brigade of the Sixth corps, distinguishing himself at the battle of Rappahannock Station (q.v.), and especially at Spottsylvania Court House (q.v.), where he was wounded. For gallantry in the last-named action he was promoted brigadier-general of volunteers and brevetted lieutenant-colonel in the regular army. He participated in the Shenandoah campaign, was wounded at the battle of the Opequon (q.v.), and was brevetted major-general of volunteers. Later he served in Georgia and Alabama in command of the 4th cavalry division under Gen. J. H. Wilson, and for his services at Selma was brevetted brigadier-general in the regular army. From 1868 to 1880 he served as lieutenant-colonel of the 25th infantry, and in the latter year was made colonel of the 4th artillery. He originated a system of military tactics which was adopted by the government in 1867, and was commandant of cadets at West Point 1870–5. Soon after attaining his colonelcy in the regular army he was attacked by mental disease and committed suicide. His publications include: 'A New System of Infantry Tactics' (1867); 'Tactics for Non-Military Bodies' (1870); 'The Armies of Asia and Europe' (1878); and 'The Military Policy of the United States.' Consult Michie, 'Life and Letters of Major-General Emory Upton' (1885).

Upton, George Putnam, American musical critic: b. Boston 25 Oct. 1834. He was graduated from Brown University in 1854, and entered journalism in Chicago a year later. He was musical critic and editorial writer on the Chicago *Tribune* for 25 years. He has published 'Letters of Peregrine Pickle' (1870); 'Lives of Haydn, Beethoven, Wagner and Liszt'; 'Standard Operas' (1890); 'Standard Oratorios' (1891); 'Standard Symphonies' (1892); etc.

Upton, Winslow, American astronomer: b. Salem, Mass., 12 Oct. 1853. He was graduated from Brown University in 1875, studied astronomy at the University of Cincinnati and in 1877–9 was assistant astronomer at the Harvard Observatory. He was engaged in the United States Lake survey as assistant engineer in 1879–80, was computer and assistant professor in the United States signal service in 1881–3, and has since been professor of astronomy at Brown University, where he was also dean in 1900–1. He served on the United States eclipse expeditions of 1878 and 1883 and was a member of private expeditions in 1887, 1889, and 1900. In 1896–7 he was absent on leave from Brown while making observations at the Southern station of Harvard Observatory at Arequipa, Peru. He has published: 'Star Atlas' (1896).

Upton, William W., American jurist: b. Victor, N. Y., 17 July 1817; d. Washington, D. C., 23 Jan. 1896. In 1838 he went to Michigan where he studied law and held various offices, being a member of the legislature which located the capital at Lansing. He went to California in 1852 and was a member of the California legislature in 1856. He was prosecuting attorney of Sacramento County, 1861–64. He moved to Portland, Oregon, in 1865, whence he was almost immediately elected to the legislature. In 1867 he became a Justice of the Supreme Court and became Chief Justice in 1872. In the presidential election of 1876 the Republicans based their claim to the Oregon vote upon a telegram of Judge Upton in which he called attention to the fact that the governor of Oregon could not exercise judicial powers in passing upon the eligibility of an elector. The Electoral Commission sustained this contention, and Hayes became president. In 1877 Judge Upton was appointed Second Comptroller of the U. S. Treasury, which position he held until his resignation in 1885, during which time he passed finally upon nearly 160,000 accounts, involving about $160,000,000. In 1885 the government published his "Digest of Decisions of the Second Comptroller of the Treasury, 1869 to 1884."

R. R. Upton.

Upton, Mass., town in Worcester County; on the Grafton & Upton Railroad; about 35 miles southwest of Boston. The town contains the villages of Upton Centre and West Upton. The chief industries are connected with farm products and the manufacture of straw hats. Pop. (1890) 1,878; (1900) 1,937.

Urabá, oo-rä-bä', Gulf of. See Darien, Gulf of.

Uræ'mia, a toxic condition caused by the presence in the blood of urinary constituents which normally should be secreted by the kidneys. The nervous system is especially affected by the poisonous blood, as shown by mental disturbances, convulsions, headache, nausea, dyspnœa, disordered vision, and coma. What the toxic material really is has not been determined. It has been proved not to be urea alone, as was formerly believed. Some contend that the poison is a mixed product of uneliminated nitrogenous excrementitions substances; others, that it is a newly formed albuminous substance not related to ordinary waste material, or is due to a disturbance of an internal venal secretion brought about by changed metabolic processes. Uræmia is usually associated with acute or chronic nephritis, or may result from suppression or deficient secretion of urine from any cause.

The symptoms of uræmia depend upon whether the condition is acute or chronic. Acute uræmia may begin with a violent headache or persistent vomiting, with dyspnœa, convulsions, mania, or coma. There may be only one of these symptoms present, or two or more may appear. The headache is usually occipital, and may be associated with deafness. The vomiting may be accompanied by diarrhœa, both being efforts to excrete the toxic material. The dyspnœa is frequently continuous and severe; the patient cannot lie down or sleep in any position with comfort; there is much restlessness and tossing about; the legs, if resting on the floor, readily

swell from œdema. There is always a probability of pulmonary œdema and cyanosis of the face and extremities. Whenever sudden uncontrollable vomiting occurs without a known cause, or a severe and more or less continuous headache appears, uræmia should be suspected and the urine examined. The temperature in acute uræmia may be but little increased, or may rise 5° to 6° F. just before a paroxysm. The pulse varies, depending upon the condition of the heart and arteries; it may be full and throbbing, or small and hard and not especially rapid. The convulsions resemble those of epilepsy, but are not attended by a cry. They may come without warning or be preceded for a few days by twitching of the muscles of the face and hands; and may occur frequently and persistently until coma ensues. Amaurosis may follow these convulsions for a few days, or hemiplegia or monoplegia may follow or precede them. The delirium of acute uræmia may be mild, muttering, or it may be maniacal. Coma is generally present when there are general convulsions, and may appear without them, sometimes preceded by headache and dulness. The breathing is stertorous and the breath foul. The patient may recover from the stupor or may remain in it for weeks.

In chronic uræmia the patient complains of severe occipital or frontal headache, more or less continuous. There is dyspnœa not dependent on exertion. There may be nausea, vomiting, diarrhœa, and stomatitis. The breath is foul, the tongue coated with a brown offensive fur. The urine is usually increased in amount, is clear, acid, has a specific gravity of 1006 to 1010, contains albumen at variable periods, also a few hyaline or granular casts, and sometimes red blood-corpuscles and leucocytes. The urea is often diminished.

The symptoms of chronic uræmia may last for months, but acute exacerbations with convulsions and coma may appear at any time, and such cases are susceptible to inflammation of the pericardium, pleura, meninges, and endocardium. Melancholia and delusional insanity may occur. The skin frequently becomes dry and itches, and muscular cramps are common.

Uræmia must be distinguished from typhoid fever, alcoholism with coma, and from some forms of diabetes and meningitis. The prognosis of uræmia is not good, especially in albuminuria patients, and those having advanced heart disease or arteriosclerosis; but patients may recover when apparently hopelessly sick.

Treatment.— Keep the patient in bed and between blankets, especially in acute attacks; prevent him at all times from being chilled; induce free action of the skin by the hot pack, the hot air or steam bath, or the hot tub bath; and keep the bowels free by saline purges. Diuretics, such as water (considered by many as the best diuretic), lemonade with cream of tartar, the liquor ammoniæ acetatis, and the citrate of potassium, cannot be dispensed with. Cupping and poulticing of the loins (if the urine is scanty), venesection, and hot saline injections are advocated. Sometimes heart stimulants such as camphor, strychnine, digitalis, and strophanthus are necessary. During convalescence tonics may be given and careful outdoor exercise resorted to, the patient being comfortably clad. In most cases the use of alcohol and tobacco should be interdicted. The diet is of prime importance. In acute uræmia it should be solely of milk, with seltzer, vichy, or kumiss. In the chronic form this should be the chief mode of administering food. As improvement sets in the patient may have meat broths, gruels, egg-albumen, custards, toast, baked potatoes, cereals, soft-boiled eggs, fresh fish, etc. Most authorities believe that red meats should not be given until the amount of urea found in the urine is about normal.

Uraga, oo-rä'gä, Japan, a seaport town of Hondo, in the Sagami province, 16 miles southeast of Yokohama. Perry Park opened in 1900 at Kurihama, a suburb, commemorates the advent of Commodore Perry's fleet at Uraga in 1853, and the negotiations which led to the opening up of Japan again to foreign commercial and political relations. Pop. 13,000.

Ural (oo'ral or ū'ral) **Mountains,** Russia, a long mountain range forming the conventional boundary between Europe and Asia, and extending in a nearly north and south direction from the Arctic Ocean to the Aral Sea, a distance of about 16,000 miles. The average height of its crest is 1,000 to 1,500 feet, but several peaks are over 5,000 feet high, the highest, Telpòs, in the northern part of the chain, having an altitude of 5,433 feet. In the north the range forms a comparatively narrow ridge, destitute of trees. Further south it becomes covered with forests, and spreads out to a width of nearly 200 miles, finally dividing on the southern boundary of Orenburg into a western and a southern outrunner, the latter known as the Mugadzhar Mountains, reaching to the Aral Sea. The principal rivers fed by the Ural chain are the Petchora, and numerous affluents of the Obi, belonging to the Arctic Ocean; and the Kama and Ural, belonging to the Caspian. The geological structure consists of an axis of granite and porphry, covered on the slopes with palæozoic strata. The mineral wealth is very great, especially in the central portion. The range is one of the principal sources of platinum, and gold is also found in great quantities, besides silver, lead, copper, iron, rock salt, and diamonds and precious stones.

Ural River, Russia, a river which rises in the Ural Mountains in the northern part of the government of Orenburg, flows first south, then west, past Orenburg so far as Uralsk, then again south through the Uralsk district, emptying into the Caspian Sea through several mouths. It is 1,485 miles long, and navigable to Orenburg for vessels of considerable size. Its sturgeon fisheries are important.

U'ral-Alta''ic Languages, a family of languages of which two grand divisions are recognized by Max Müller, the Northern and the Southern. In the northern division are comprised the Tungusic, the Mongolic, the Turkic, the Finnic, and the Samoyedic. The Tungusic dialects, lowest of all these in organization, extend northward and westward from China. Of a grade a little higher are the Mongolic dialects of China: in these the different parts of speech are hardly distinguished. On the other hand, the Turkic dialects, chief among them the Osmanli of Constantinople, are rich in grammatical forms; Turkic speech is spoken from the Polar Sea to the Adriatic. The Finnic division com-

prises the speech of the Baltic coasts and the Hungarian or Magyar. (See FINNS; HUNGARY.) Among the languages of the southern division are the Tamulic or Dravidian dialects of southern India (see TAMIL); the Tibetan, the Taic or the dialects of Siam, and the Malaic or Malayan and Polynesian dialects. The Ural-Altaic languages all possess one characteristic feature; in them the radical or root is never obscured; the determining or modifying syllables are usually placed at the end; the vowels in a word may be changed and modulated to harmonize with the keynote struck by its chief vowel. In the Turkish, for example, if a verb contains a sharp vowel in its radical portion, the vowels of the terminations are all sharp; but the same terminations when they follow a root with a flat vowel, modulate their vowels into a flat key; thus *mek* or *mak* being the infinitive termination of verbs, *sev-mek* is the infinitive verb to love, but *bak-mak* is the infinitive verb to regard. The Ural-Altaic languages are sometimes called Turanian, also Finno-Tartar.

Uralite, a mineral which is a variety of amphibole and is produced by the alteration of pyroxene. Found very abundantly in various rocks.

Uralsk, oo-rälsk', Russian Central Asia, the capital of the district of Uralsk, situated on the Ural River, at the foot of the mountains, 160 miles southwest of Orenburg, and 280 miles north of the Caspian Sea, on the railroad between Orenburg and Saratov. It has numerous churches, two high schools, a library, a museum, and a theatre, steam mills, brick kilns, and a brewery. Pop. (1897) 36,597.

Urania, ū-rā'nĭ-a, the "heavenly one," sometimes a title of Aphrodite, as the goddess of noble love, but more commonly the name of the muse of astronomy, a daughter of Zeus and Mnemosyne. She is generally represented with a crown of stars, in a garment spotted with stars, and holding in her left hand a celestial globe or a lyre. By Apollo she was mother of Hymenæus and Linus. See MUSES.

Urani'idæ, a family of moths. See MOTH.

Uraninite, Uranin, or Pitchblende, a dark-green to black mineral belonging to the isometric or cubical system. Usually occurs in a massive condition. Brittle, hardness 5.5; specific gravity, 6.4 to 9.7; lustre, submetallic and greasy or pitch-like; streak, brownish-black to dark olive green; fracture, conchoidal; composition: an oxide of uranium that may be considered a uranate of uranyl. It also contains some lead and very small amounts of other elements, among which are radium (q.v.) and the rare gaseous elements helium. Pitchblende is the chief commercial source of uranium and radium. It is mined in considerable quantity at Joachimsthal in Bohemia. Found also in many other places as Cornwall, Saxony, Hungary, Turkey and in the United States in Connecticut, North Carolina, etc.

Ura'nium, a metallic chemical element, symbol U, atomic weight 238.5, specific gravity 18.6. It was discovered by Klaproth (1789) in the mineral pitchblende and named by him in honor of Herschel's discovery of the planet Uranus. The body discovered by Klaproth was really the oxide of uranium, the free metal being first isolated by Peligot (1842). It is one of the rarer elements and occurs in nature only in combination with other elements. The principal minerals containing it in any considerable quantity are *uraninite* or pitchblende (75 to 85% U_3O_8), a greenish mineral coming chiefly from Joachimsthal in Bohemia, though found in other places; *gummite,* a hydrated calcium lead uranium silicate; *uranosphærite,* a hydrated bismuth uranite; *torbernite,* a hydrated copper uranium phosphate from Saxony and Cornwall; and *autunite,* a hydrated calcium uranium phosphate from the same regions. The metal is prepared by heating a mixture of uranium chloride, sodium chloride, and carbon or of uranium chloride, sodium chloride and metallic sodium. It is a malleable white metal looking like nickel. It oxidizes very slowly in the air at ordinary temperatures, but rapidly burns to U_3O_8 when heated above 400° F. Is soluble in mineral acids. It acts both as an acid and a basic element. We have *uranous* salts such as UCl_4, *uranyl* salts in which the group UO_2 acts as a basic radical, example uranyl chloride $(UO_2)Cl_2$ and *uranates* which are formed by the combination of the oxide UO_3 with strong bases. Sodium uranate, or uranium yellow, is used in glass and china painting and in the manufacture of beautiful fluorescent uranium glass. Metallic uranium and minerals containing its compounds possess marked radioactivity. See RADIUM.

Uranus, ū'ra-nŭs, in Greek mythology, the son of Gæa, the earth, and by her the father of the Titans, Cyclopes, etc. He hated his children, and confined them in Tartarus, but on the instigation of Gæa, Kronos, the youngest of the Titans, overthrew and dethroned him.

Uranus, in astronomy, one of the primary planets, and the seventh from the sun, discovered by Sir William Herschel in 1781. To the naked eye it appears like a star of the sixth magnitude. Its mean distance from the sun is about 1,754 millions of miles, and the length of the year 30,686.82 days, or about 84 of our years. Its mean diameter is estimated at about 33,000 miles. Its volume exceeds the earth's about 74 times, but as its mean density is only 0.17 (the earth's being 1) its mass is only about 12½ times more. The length of its day is supposed to be between 9 and 10 hours.

Urates, or Lithates. Uric acid is sometimes called lithic acid and the salts of uric acid are therefore spoken of sometimes as *urates* or *lithates.*

Urban, ėr'ban, the name of eight popes, as follows:

Urban I., Saint. He was the son of a Roman noble, Pontianus, and succeeded Calixtus I., in 222. He suffered martyrdom in 230.

Urban II. (ODO OF LAGNY): b. Chatillon sur-Marne, France, about 1042; d. Rome 29 July 1099. He was a canon of Rheims, and a monk of Cluny where Gregory VII. met him and invited him to Rome. He was soon after appointed cardinal and bishop of Ostia, and in 1088 he succeeded Victor III. The anti-pope Clement III. was then in possession of Rome, but was obliged to flee in 1089. He returned in 1091 only to be again driven out in 1093 when Urban resumed possession of the city. At the council of Clement, in 1095, Urban preached the first crusade, and at the council of Bari in

1098 he attempted to bring about a union of the Greek and Latin churches. He maintained the validity of papal elections independently of the consent of Roman emperors, zealously enforced the law of priestly celibacy and forbade the clergy to accept ecclesiastical offices from laymen.

Urban III. (Umberto Crivelli, oom-bĕr'tō krĕ-vĕl'lē): b. Milan; d. Ferrara 20 Oct. 1187. He was archbishop of Milan and succeeded Lucius III. in the papal chair in 1185. He endeavored to send assistance to the Christians in the East, who were being sorely pressed by Saladin, and after a struggle with Frederick Barbarossa was about to excommunicate that monarch when his own death intervened.

Urban IV. (Jacques Pantaléon, zhäk pän-tä-lā-ôń): d. Orvieto, Italy, 2 Oct. 1264. He was of French birth, the son of a shoemaker, and became successively canon of Liège, bishop of Verdun, and patriarch of Jerusalem. He succeeded Alexander IV. in 1261. He excommunicated Manfred, king of Naples, and offered the crown to Charles, Count of Provence and Anjou, and brother to Louis IX. of France, which led to the subsequent wars of the Anjous for the possession of Sicily and Naples. He established the feast of Corpus Christi, first celebrated at Orvieto, 19 June 1264.

Urban V. (Guillaume de Grimoard, gē-yōm dē grē-mō-ār): b. diocese of Mende, France; d. Avignon, France, 16 Dec. 1370. He was a Benedictine monk who became renowned as a professor of canon law and Scripture and was raised to the dignity of abbot of St. Victor at Marseilles and papal legate. He succeeded Innocent VI. in 1362. He restored the papal seat from Avignon to Rome in 1367, founded many churches, and was a profound student and the patron of scholars. He was the first pope to bless a golden rose for princes.

Urban VI. (Bartolommeo Prignano, bär-tō-lōm-mā'ō prēn-yä'nō): b. Naples: d. Rome 15 Oct. 1389. He was archbishop of Bari and chosen to succeed Gregory XI. in 1378. The French cardinals dissatisfied with Urban withdrew to Anagni and there elected Robert of Geneva, who took the name of Clement VII., and took up his residence in Avignon. Thus was originated the famous "Western Schism," which endured for nearly 50 years. Urban has been characterized as of harsh and violent temper, but an impartial survey of history will rather credit him with being severe and rigorous in disposition, which his enemies interpreted for their own purposes.

Urban VII. (John Baptist Castagna, käs-tän'yä): d. 28 Sept. 1590. He was archbishop of Rossano, cardinal and papal legate to Spain, and succeeded Sixtus V. in 1590, but died 13 days after his election.

Urban VIII. (Maffeo Barberini, mäf-fā'ō bär-bā-rē'nē): b. Florence 1568; d. Rome 29 July 1644. Under Gregory XIV. he was governor of Fano, under Clement VIII. papal prothonotary, and in 1604 became archbishop of Nazareth (*in partibus infidelium*) and ambassador to Paris. He became cardinal presbyter the next year and archbishop of Spoleto in 1688. He was elected successor to Gregory XV. 6 Aug. 1623. He condemned the Jansenist tenets which then flourished in France, built the Collegium Urbanum or College of the Propaganda, established the Vatican Seminary, and issued the bull 'In Cœna Domini' in its present form. He also gave the cardinals the title of Eminence, regulated the number of feasts of obligation, put forth a revised breviary, and was the author of some Latin and Italian poems. Consult: Ward, 'Copernicanism and Pope Paul V.' (Dublin 'Review' 1871); H. de l'Epinois, 'Les pièces du procès de Galileo' (1877).

Urbana, ėr-băn'a, Ill., city, county-seat of Champaign County; on the Illinois Central, the Wabash, the Cleveland, C., C. & St. L. R.R.'s; about 78 miles northeast of Springfield, and 128 miles south by west of Chicago. It is in an agricultural region, and in the vicinity are valuable deposits of fire-clay. It was settled in 1824, incorporated 6 May 1833, and chartered as a city in 1860. The chief industrial establishments are the "Big Four" railroad shops, with 700 employees; brick works, 300 employees; and lawn mower and machine works, 50 employees. The principal public buildings are the county court-house, municipal buildings, Y. M. C. A. building, the churches, and schools. The educational institutions are the State University (q.v.), the Thornburn High School, public elementary schools, and two libraries. The three banks have a combined capital of $500,000, and the average annual business amounts to $5,000,000. The government is administered under a charter granted by the Legislature, which provides for a mayor and a council of 10 members, who are elected annually. Pop. (1890) 3,511; (1900) 5,728.

J. K. Groom,
Editor 'Courier.'

Urbana, Ohio, city, county-seat of Champaign County; on the Erie, the Pittsburg, C., C. & St. L., and the Cleveland, C., C. & St. L. R.R.'s; about 95 miles north of Cincinnati and 45 miles west of Columbus. It is in an agricultural region. The chief industrial establishments are the U. S. Rolling Stock Company works, carriage and wagon factories, stove works, machine shops, agricultural-implement works, shoe factories, broom and furniture factories, woolen mills, straw-board works, water-wheel works, a tannery, and a flour mill. The principal public buildings are the county court-house, municipal buildings, churches, and schools. The educational institutions are Urbana University (Swedenborgian), founded in 1850, a high school (building cost $125,000), public and parish elementary schools, public library, and the library of the university. The three banks have a combined capital of $300,000 and deposits amounting to $992,030. Pop. (1890) 6,510; (1900) 6,808.

Urbino, oor-bē'nō, Italy, a town in the province of Pesaro e Urbino, on an isolated hill in the midst of bleak and desolate mountains, 21 miles west by south of Pesaro. It is the see of an archbishop, and the seat of a university with two faculties — jurisprudence, and mathematics and natural science. Among the buildings deserving of notice are the ducal palace, one of the finest edifices of the kind in Italy, and the cathedral. Urbino is the birthplace of the painter Raphael. His house is still shown, and a statue of him was erected in 1897. From 1474 to 1626 Urbino was the capital of a duchy. Pop. (1901) of commune, 18,307.

Urd. See Norns.

Urdaneta, oor-dä-nā'tä, **Andres,** Spanish navigator: b. Villafranca, Spain, 1498; d. Mexico, 3 Nov. 1568. He was appointed by Philip II., chief pilot of the expedition under Miguel Lopez de Legazpe (q.v.) for the conquest of the Philippine Islands. He sailed with the expedition from La Navidad, Mexico, 21 Nov. 1564, and after the capture of Cebu and Mindoro he returned to Mexico, where he died.

Urdaneta, Philippines, pueblo, province of Pangasinán, Luzon, on the Macálang River, 20 miles east of Lingayén. It is on the highway from Villasis to Santa Barbara. Pop. 16,588.

Urdu, oor'doo, a dialect of the Hindi: it is in English usually called Hindustani: the native name, now given to it by philologists, means "camp language," from the Turkish *urdu,* meaning camp. It is really the Hindi, a language of the Aryan family, with a multitude of Persian, Arabic and Turkish words introduced into it. These intrusions, however, have in no wise altered or influenced the language itself, which, as regards its inflectional and phonetic elements, remains a pure Aryan dialect. The area over which the Urdu is spoken in North India is coextensive with that of the Hindi, estimated at 250,000 square miles, extending from the Gandak River in the east to the Sutlej in the west, and from the Himalaya in the north to the Vindhiya Mountains in the south. Moreover, it is the *lingua franca* of most parts of India. It has a considerable literature, chiefly historic, commencing with Akbar (1556–1605). See Sanskrit.

Ure, ūr, **Andrew,** Scottish chemist: b. Glasgow 1 May 1778; d. London 2 Jan. 1857. He was educated at the universities of Glasgow and Edinburgh, was graduated in medicine from the former in 1801, and in 1804 was appointed professor of chemistry and natural philosophy at the Andersonian Institution in Glasgow. He was one of the founders of the Glasgow Observatory, and in 1809 was appointed its first director, but removed to London in 1830, where, in 1834, he became analytical chemist to the board of customs. He published: 'A New Systematic Table of the Materia Medica' (1813); 'Dictionary of Chemistry' (1821); 'New System of Geology' (1829); 'The Cotton Manufacture of Great Britain' (1836); 'Dictionary of Arts, Manufactures, and Mines' (1837); etc.

U'rea is the principal waste product in the urine of mammals, and it occurs in small amounts in that of birds, especially when they are fed on meat. In the urine of man it is present to the amount of 2.5 to 3.2 per cent, and also occurs in the blood in the proportion of 0.025 per cent, and may be obtained from the liver, the perspiration, and the lymph. Under the influence of bacteria it undergoes alkaline fermentation, and carbonate of ammonia is formed. Urea is the final product of the decomposition of proteids in the body, the proteids of food, of the tissues, and of the blood and lymph. It is the form in which the nitrogen of the body is given off, and is believed to be formed in the liver out of leucin, tyrosin, and other products, and to be separated by the kidneys from the blood when that fluid reaches them. When the liver is diseased there is likely to be a diminished amount of urea excreted. It is increased in proportion to the amount of nitrogenous food, such as meat, which is absorbed, and probably also by muscular exercise. In the conversion of proteids into urea the change is not immediate; there are formed intermediate substances — leucin tyrosin, creatin, etc.

"In disease, urea is retained in the system in all cases where there is decreased diuresis, disease of the kidneys or diminished arterial pressure. Excessive perspiration, diarrhœa, and transudation of water into the serous cavities of the body, or into the connective tissue, by lessening the fluids excreted by the kidneys, also diminish the quantity of urea secreted. Urea is increased in acute febrile diseases until the acme of the fever is reached. It then later becomes subnormal, and during convalescence gradually approaches the normal."

Uredina'ceæ, the family of minute parasitic plants called rusts. See Fungi.

Ure'ter, the excretory duct of the kidney, which serves to convey the urine from the latter organs to the urinary bladder. In man each ureter averages from 16 to 18 inches in length, and is of the average diameter of a goose-quill. It consists of three coats, an outer or fibrous, a middle or muscular, and an inner or mucous coat. The ureter on leaving its kidney passes behind the peritoneum or lining membrane of the abdomen, at the back of the latter cavity. It runs downward and inward from the lower part of the pelvis of the kidney, and enters the cavity of the bony pelvis (q.v.), passing downward and forward to open into the base of the bladder. The ureters open into the bladder each by a constricted orifice, and each in its course lies upon the psoas muscle. They derive their nerves from the inferior mesenteric, spermatic, and hypogastric plexuses; and their blood-vessels form the renal, spermatic, and other arterial trunks. See Kidneys.

Ure'thra, the canal leading from the bladder to the external urinary opening, and serving for the excretion of the urine. In the male the urethra traverses the penis, and its length varies from 8 to 9 inches. In the female it is a narrow membranous canal attaining a length of about 1½ inches, with a normal diameter of about ¼ inch. It is thus a much more complicated structure in the male than in the female, and its anatomy and relations have to be carefully studied by the surgeon in view of the diseases to which it is subject, and also in connection with the important operations of lithotomy and lithotrity (qq.v.). The urethra in man consists of three coats: a mucous, a muscular, and an erectile coat. In the female the urethra is capable of great distention, so much so that it may be artificially dilated so as to permit the removal of calculi from the bladder without further operation.

Urga, oor'gä, or **Bogdo-Kuren,** Central Asia, a town in Northern Mongolia, on the Tola, at an elevation of 4,370 feet above sea-level. It contains several large Buddhist monasteries, occupied by about 10,000 monks, and is a sacred city of the Buddhists, the seat of a high priest or lama. With the exception of the monasteries and temples the town is dirty and ill-built. It is the seat of the Chinese administration of Northern Mongolia, and there is a separate Chinese quarter. It is also a considerable trad-

ing centre, lying as it does at the junction of highways between Kiakhta and Peking. Estimated pop. 30,000 to 40,000, part of whom are nomadic.

Uri, oo'rĭ, Switzerland, a canton in the central part of the country, bounded by the Schwyz, Glarus, Grisons, Ticino, Valais, Bern, and Unterwalden, and extending from the south-eastern shores of the Lake of Lucerne almost to the Italian frontier. Area 415 square miles. Capital, Altdorf. The canton is traversed lengthwise by the narrow valley of the Reuss, which empties into the Lake of Lucerne, and which is hemmed in by lofty, glacier-covered mountains belonging chiefly to the Glarner and Urner Alps. Large numbers of cattle, sheep, and goats are raised, and excellent cheese produced. The principal mechanical industry is the manufacture of explosives and ammunition. The canton is traversed by the Gotthard railroad, and the tourist traffic is important. The inhabitants are chiefly Germans and Roman Catholics. Pop. (1900) 19,759.

U'rial, a wild sheep. See Oorial.

Uric Acid, a crystallizable acid formerly called lithic acid, is a waste product found in small amount in normal human urine (q.v.) — 6.17 to 12.34 grains in 24 hours — usually combined with sodium, ammonium, potassium, calcium, and magnesium to form urates; but when the urine is very acid it appears in the form of crystals, lozenge- or whetstone-shaped, and of a yellowish-red color. It has been detected in the spleen, heart, liver, brain, and blood, especially the blood of gouty persons. It is abundant in the urine of birds and reptiles, and in guano. Urinary calculi and gravel consist frequently of uric acid or the salts formed from it. The concretions improperly called chalk-stones, which form in the joints of persons suffering from gout are composed of uric acid. This acid is increased by an animal diet, in febrile conditions and in gout, and by muscular fatigue. It is decreased by a diet containing but little nitrogen, by starvation, certain drugs, etc. Uric acid may be considered as one of the final products of oxidation, as is the case with urea, and, according to recent experiments, as one of the products of nuclein metabolism, formed from the nuclein of leucocytes and tissue-cells. This oxidation probably takes place everywhere in the body, but most actively where cells are most numerous. The view that uric acid results from the incomplete oxidation of proteids in the liver is no longer held, but the acid seems sometimes to be formed in the kidneys. When the spleen is enlarged the quantity eliminated is increased. Scientists no longer assign to uric acid the poisonous properties once believed to belong to it.

Uriel, ū'rĭ-ĕl, one of the archangels of the Hebrew Midrash and apocryphal Scriptures. The name means "the Light of God." Uriel is described as standing on the left hand of the throne of God, where he ministers light and forgiveness of sins to the children of Israel. He is introduced by Milton into 'Paradise Lost,' and also appears in Longfellow's 'Golden Legend.'

U'rim and Thum'mim, in Hebrew ritual, two appurtenances of the breastplate worn by the high priest. The two words, both plural, signify literally "lights" and "perfections"; in the Septuagint they are translated *delosis* (manifestation) and *alethcia* (truth), and in the Latin Vulgate *doctrina* (teaching or learning) and *veritas* (truth). In the Hebrew Scriptures the two words are inseparable save in 1 Sam. xxviii. 6, where Urim alone occurs. The firt mention of Urim and Thummim is in Ex. xxviii. 30; the other passages in which they occur are: Lev. viii. 8; Num. xxvii. 21; Deut. xxxiii. 8; Ezra ii. 63; Nehem. vii. 65. They appear to have served as an oracle through which the Divine Will might be ascertained. Jonathan Edwards writes that the High Priest's breastplate was called the breastplate of judgment because "in matters of judgment that were too hard for the judges they were to come to the Priest, who was to inquire of God by Urim and Thummim, in the breastplate, for a determination." The Jewish historian Josephus and some modern commentators teach that the Urim and Thummim are simply the twelve precious stones of the breastplate. Both Josephus and the ancient Rabbins held that those precious stones indicated the Divine Will by a preternatural luminousness. Renan, interpreting the existing Hebrew texts with the aid of the Septuagint, regards the instrument of the Urim and Thummim either as a sort of chessboard or as a whirligig or rotating winged globe ('Hist. Peup. d'Isr.,' I., 275).

Urinary Analysis, that branch of chemical and microscopical analysis which has to do with the detection or quantitative estimation of the constituents of urine. In practice, it is mostly concerned with the examination of the urine for such constituents as may have a known clinical significance. The average quantity of urine passed by an adult is probably about 50 fluid ounces (1,500 cubic centimetres) per day, though this may vary widely within the limits of health. The quantity is increased by drinking large amounts of water, and, temporarily, by the administration of diuretics; and it is decreased by unusual activity of the skin, as well as by several other causes. In general, the quantity of water taken into the system through the mouth must be equal, in the long run, to that which is eliminated through the kidneys, skin, bowels, lungs, and nose. The specific gravity of the urine also varies to a considerable extent, the normal specific gravity, when the quantity passed is 50 ounces per day, being about 1.020. Any cause which tends to increase the quantity of urine secreted will, in general, decrease the specific gravity, and *vice versa;* the total quantity of solid matter that the urine contains in solution being normally much less variable than the quantity of the urine itself. The specific gravity has a marked significance in itself only when it is high without the urine being scanty, or low without the urine being copious. The ideal way to obtain a sample for analysis is to save what is passed throughout the 24 hours, mix it, and take the sample from the result. Urine thus obtained is technically called "mixed urine." It is often inconvenient to go to this trouble, especially in hot weather, when special care must be taken to prevent the mixed product from spoiling before the sample can be prepared and transmitted to the analyst; and it is therefore customary to take the sample from what is passed in the morning, experience

indicating that a specimen taken at this time will correspond fairly well with mixed urine. Mixed urine should always show a slightly acid reaction, and the same is true of samples taken at any time during the day, except after a meal, when the reaction may be neutral, or even alkaline. Urine often contains slight clouds of mucus or other substances, which become visible after the specimen has been allowed to stand for a short time. These are usually of no clinical importance, merely indicating some slight irritation along the urinary passages, or some recent indiscretion in diet. After urine has been passed (and more quickly in hot weather than in cold) the urea that it contains soon begins to ferment, passing into the form of ammonium carbonate; and when the quantity of ammonium carbonate present is sufficient to make the reaction distinctly alkaline, the urine becomes semi-opaque from the deposition of a white cloud of phosphates, urates, and other substances.

In the examination of a specimen of urine, the analyst cannot undertake to test it for every constituent that might conceivably be present as a pathological symptom. He will be guided by the general nature of the patient's illness, and will seek for those elements which may be of special significance. In the examination of presumably healthy candidates for life insurance, it is customary to look for nothing but albumin and sugar, unless the specific gravity, when considered in connection with the quantity of urine passed, is high enough to indicate the presence of an abnormal amount of some other constituent. In general practice, however, it is often necessary to examine, not only for sugar and albumin, but also for pus, biliary coloring matters, blood-corpuscles, and "casts" from the little uriniferous tubes of the kidneys. It is frequently important, too, to make a more or less accurate quantitative determination of the urea that is passed, and sometimes of the chlorides also.

A "cast" may be formed in the kidney in any one of several ways, the simplest being by the direct exudation, into a little tubule of the kidney, of some coagulable constituent of the blood. After this becomes solidified, it may eventually become discharged from the tubule with the urine, and pass into the bladder in the form of a microscopic plug of approximately cylindrical shape. To detect the presence of casts and of blood-corpuscles and other undissolved constituents, the urine is allowed to stand for some time in a conical glass vessel, whose sides slope down to an acute point at the bottom. After a couple of hours, or when it is judged that the solid constituents that may be present have settled to the bottom or risen to the top, or taken such other positions as may correspond to their specific gravities, a few drops are drawn off by means of a pipette from the surface, and from the very apex of the glass at the bottom, and also from such other levels as may appear to contain floating matters; and every sample so taken away is separately and carefully examined under the microscope. The correct identification of the different objects that such an examination reveals calls for a considerable amount of practical experience with the microscope. Much assistance may be derived, however, from Beale's 'One Hundred Urinary Deposits,' which gives engravings of all the ordinary deposits that the analyst will be likely to meet, including such extraneous things as fibres of wool and cotton and bits of feather, which often find their way into the specimen to be examined.

Albumin is not a normal constituent of urine, and when it is present continuously and in any considerable quantity it constitutes a grave symptom. When present, it is in solution, and hence is not at all evident to the eye until it has been coagulated by the action of heat or some other agent. In testing a sample by heat, a test tube is half filled with perfectly clear urine, and heat is applied to the upper part of the liquid, until boiling occurs. If the boiled urine becomes turbid in the least degree, the turbidity is due either to the presence of coagulated albumin, or to the precipitation of the phosphates of lime and magnesia that are normally present in all urine. The earthy phosphates promptly re-dissolve upon the addition of a few drops of nitric or acetic acid; but if the turbidity is really due to albumin, it does not pass away upon this treatment. The object of heating only the top part of the test tube holding the urine is to facilitate the recognition of a precipitate, a comparison of the upper and lower parts of the test tube, in a good light, rendering the slightest loss of transparency quite visible. If no precipitate is obtained, a drop or two of nitric acid should be added, and the boiling repeated. A number of trials of this sort should be made, the nitric acid being added, a few drops at a time, until a considerable quantity of it is present. The consistent absence of a precipitate in all these tests indicates that albumin is not present. Physicians often make the serious error of adding too much nitric acid to the urine at the start. This is dangerous, because if any considerable quantity of nitric acid is added at the outset, it not infrequently happens that albumin will not be thrown down at all, even when much albumin is really present. The directions given above should therefore be followed implicitly, the urine being first boiled without any acid at all, and then again after successive additions of a drop or two have been made, until as many as 15 or 20 drops have been added.

"Heller's test" for albumin depends upon the fact that strong nitric acid throws down albumin from its solution, in the cold. In applying this test, a convenient quantity of strong, pure, colorless nitric acid is first placed in the bottom of a small test tube, and an equal bulk of perfectly clear urine is allowed to flow down upon it gently, the test tube being inclined so that the urine may float upon the surface of the acid, and not mix with it. If albumin is present, a sharp white zone appears at the surface of separation of the acid and the urine, the thickness of this zone varying with the quantity of albumin present. When normal urine is treated in this manner, a brown ring is formed at the surface of separation. In cases of fever, or when there is an excessive amount of coloring matter of any kind present, the albumin in Heller's test may be tinted, so as to appear brownish, reddish, violet, or greenish. Urates, when present in excess, also give a zone marked by a precipitate; but the precipitated urates differ from albumin in being soluble when the urine is cautiously warmed without being allowed to mingle with the acid to any great extent.

In testing urine for the presence of sugar, the test is ordinarily made to depend upon the

fact that diabetic sugar will throw down a yellowish or reddish precipitate of oxide of copper from an alkaline solution of copper sulphate and sodium (or potassium) tartrate. The test solutions that are ordinarily employed for this purpose are known, respectively, as "Fehling's solution" and "Pavy's solution" (qq.v.). In making a test, about one cubic centimetre of the test solution is placed in a test tube, diluted with about four times its own bulk of water, and then boiled for a few seconds. If a precipitate is thrown down by this treatment, the test solution has spoiled, and should be replaced by a freshly prepared one. If no precipitate is thrown down by boiling the test solution alone, the suspected urine should be immediately added, drop by drop. If any considerable quantity of sugar is present, a precipitate will be obtained almost immediately. In the absence of a precipitate, however, the urine should be added, a few drops at a time, with occasional heating, until the quantity added is about equal to that of the original, diluted test fluid. If no precipitate is obtained, sugar, clinically speaking, is absent. It should be observed that the formation of an actual precipitate must be observed in this test; the mere decolorization of the blue test solution being no criterion of the presence of sugar. Other methods are known for the detection and estimation of sugar in urine, but the copper test, as described above, is the one upon which physicians rely almost exclusively.

The nitrogen waste of the body passes away mainly through the urine, in the form of urea, CON_2H_4, and of compounds of uric acid ($C_5H_4N_4O_3$) with the alkalies and the alkaline earths. The approximate estimation of urea and uric acid is therefore often of considerable importance. The determination of urea by the well-known "hypobromite process" is based upon the fact that sodium hypobromite, NaBrO, decomposes urea quickly and completely in accordance with the equation $CON_2H_4 + 3NaBrO = 3NaBr + CO_2 + 2H_2O + 2N$. The sodium bromide (NaBr) that is formed remains in solution, and the carbon dioxid (CO_2) that is liberated is absorbed by the test solution, which is made to contain a large excess of sodium hydrate. The only visible product of the decomposition is the nitrogen gas, which is collected and measured, and which serves to indicate the quantity of urea decomposed. The hydrobromite solution is made from water, caustic soda, and bromine. Various proportions are used, but Tyson recommends dissolving 100 grams of caustic soda in 250 cubic centimetres of water, and adding 25 cubic centimetres of bromine to the solution so formed. In practice, the reaction is carried out in a special form of apparatus, which has a vertical graduated tube to collect and measure the nitrogen. The apparatus is first filled with the test solution, and one cubic centimetre of urine is then introduced into it by means of a pipette. The decomposition of the urea begins at once, a copious stream of nitrogen bubbles passing up into the vertical collecting tube. In 20 minutes or less the reaction is complete, and the number of cubic centimetres of free nitrogen is read from the graduated collection tube. For great refinement, the volume of this gas must be corrected to standard conditions of temperature and pressure; but for ordinary clinical purposes this is not necessary, and it is sufficient to read the number of cubic centimetres of gas directly from the apparatus. Multiplying this number by 0.00282, we obtain the number of grams of urea that the given cubic centimetre of urine contained; and upon multiplying this product again by the total number of cubic centimetres passed by the patient, we obtain the total number of grams of urea passed. The total amount of urea passed by a healthy adult may range from 20 to 40 grams per 24 hours.

In health, practically all of the uric acid in the urine occurs in combination with potassium, ammonium, sodium, calcium, and magnesium, in the form of salts known as "urates." Uric acid itself is highly insoluble, 14,000 parts of cold water dissolving only one part of the acid. To estimate the quantity that is present, 200 cubic centimetres of urine are acidulated by the addition of 20 cubic centimetres of nitric acid, and set aside in a cellar or other cool place for 24 hours. The nitric acid gradually replaces the uric acid in its combinations, and the freed uric acid, owing to its insolubility, is deposited upon the sides and bottom of the beaker in the form of yellowish-red crystals. These may be collected, washed with cold distilled water, and then dried and weighed; the weight so obtained giving the quantity of uric acid present in 200 cubic centimetres of the urine. In health, the quantity of uric acid passed by the kidneys in 24 hours may range from 0.4 to 0.8 gram. The heavy "brick-dust" deposit that is often observed in urine that has stood for a time, and which is frequently referred to in the advertisements of proprietary "kidney cures," for the purpose of terrifying the uninformed public into buying these "cures," consists mainly of urates, which are soluble at the temperature of the body, but relatively insoluble at the ordinary temperature of a sleeping-room, and hence are apt to be thrown down. This sediment is found most commonly in urine that is somewhat more acid than usual. It also occurs in connection with defective assimilation of the food, and is not to be regarded as of importance, unless it is markedly abundant or persistent; and even in these cases it points to an imperfect digestion, rather than to trouble with the kidney.

Consult Tyson, 'Practical Examination of Urine.'

A. D. Risteen, Ph.D.,
Editorial Staff, 'Encyclopedia Americana.'

Urinary Bladder. See Bladder.

Urinary Calculus. See Calculus.

Urinary Organs, the organs concerned in the secretion and discharge of urine; namely, the kidneys, which secrete the urine; the ureters which convey it to the bladder; the bladder or hollow organ in which it is stored; and the urethra, by which it is passed out of the body. All of these organs are lined with a continuous mucous membrane. See Bladder; Kidneys; Ureter; Urethra; Urine.

Urine, the fluid secreted by the kidneys, stored in the bladder and discharged by the urethra. It is an excrementitious fluid, ejecting from the system substances which if retained would impair health and destroy life (retention and suppression of urine). Healthy urine consists of water, urea, uric acid, hippuric acid, creatinin, phosphates, chlorides, and sulphates, mucus and other ingredients. The abnormal matters found in the urine in various

conditions include acetone, albumin, albumose, bile, blood, cystin, glucose, hemoglobin, fat, pus, spermatozoa, epithelial cells, casts, etc. (See URINARY ANALYSIS.) Normal urine is a transparent aqueous fluid, of an amber color, acid reaction, a peculiar odor, and with a specific gravity of about 1020 when passed in the average quantity of 50 ounces in the 24 hours. But each one of these characteristics is liable to some variations within the limits of health, as well as in disease.

As to transparency, it is quite constant, but cannot be considered an essential of normal urine, and on the other hand, because a given specimen of urine is transparent it is not necessarily normal. Urine transparent when passed frequently shows a faint cloudiness in some portion when standing, due to mucus, the slimy secretion from the mucous surface of the urinary organs. This cloudiness is most pronounced in the urine of females. Mucus can be filtered out, leaving the urine clear. Normal slightly acid urine may be somewhat turbid when passed from the presence of the earthy phosphates of calcium and magnesium, which after a time subside in the vessel, becoming a sediment. This sediment will disappear on the addition of a few drops of any acid, as nitric, but is increased by heat applied. Sometimes normal urine, on standing for a short time in a cold room, deposits a white or pink light sediment, the mixed urates of sodium, potassium, calcium, and magnesium. This is believed to be due to the lowering of the temperature of the urine. Normal urine may also be somewhat turbid from the presence of alkaline carbonates. Pathologically, urine may be more or less opaque from abnormal degrees of the above conditions, or from the presence of pus, bacteria, or fat, as in chylous urine, so called. As the result of disease the normal aqueous urine may become viscid or glutinous from the presence of mucus, or mucus and pus, etc. As to the color of normal urine, it is subject to considerable variation in health. As color is due to coloring matters in solution, it is deeper or paler according to the proportion of water present. For example, after much beer or water drinking the discharge of urine is large and the color very pale. When the skin is active, excreting much water in perspiration, the amount of urine is diminished and the color darker than usual; but in winter, when the skin is less active, the urine is increased in amount and is of lighter color. As the result of disease, there may be almost an entire absence of color, as in the copious urines of diabetes, hysteria, and convulsions. Or it may be high colored in fevers and febrile states, due to a diminution in the amount of water and the addition of abnormal coloring matters such as blood, or blood-coloring matters or bile pigments. Certain vegetable matters, such as santonin, also color the urine.

The reaction of normal mixed urine or the urine of the entire 24 hours is always acid. Freshly passed urine at different times of the day shows usually a varying amount of acidity; but urine examined three or four hours after a meal may be neutral or even alkaline. The cause of this change is still doubtful. Urine allowed to stand for a short time, especially at a moderate temperature, sometimes increases in acidity. The cause is not definitely settled. Neutral and even acid urines standing for some time, especially in hot weather, becomes alkaline, have an ammoniacal odor, and are turbid, and sometimes an iridescent pellicle forms on the surface. The turbidity and sedimentary deposits are caused by the precipitation of the crystalline triple phosphate of ammonium and magnesium, the amorphous phosphate of lime, the urate of ammonium, and to bacteria.

The peculiar and characteristic odor of normal urine becomes a "strong odor" in highly concentrated urines, a "putrescent" one when mucus and other organic matters are decomposed, an "ammoniacal" one when the ammonium carbonate has formed from the urea, or a sweetish one from the presence of sugar in the urine.

Certain substances ingested also give distinctive odors to urine, as turpentine producing the odor of violets, and the odors of cubebs, copaiba and sandal-wood oil.

The specific gravity, though normally about 1020, for 50 ounces of urine per 24 hours, when the skin is not acting freely and after copious use of water and diuretics, may descend to 1010 or lower and yet be within the limits of health. Or when the urine becomes concentrated by the drain of water through the skin or some other channel the specific gravity may rise to 1030 or higher. The normal range may be said to be from 1005 to 1030, but to be reliable, observation should be made on the entire quantity of urine passed in 24 hours. The specific gravity in diabetes mellitus sometimes reaches 1050, and, according to Tyson, if in a copious urine the specific gravity is over 1028 there is a suspicion of diabetes, and even if it is 1010 or lower it is not safe to infer from this circumstance alone the absence of sugar. Specific gravity is also increased in the first stage of acute fevers, and of acute Bright's disease. It is lowered in hysterical complaints and in all forms of nephritis except the acute.

The quantity of urine is increased in diabetes mellitus and insipidus, in hysterical and convulsive conditions, in cardiac hypertrophy and all conditions which cause increased blood pressure, by the peripheral action of cold, etc. It is diminished in most forms of Bright's disease and in the early history of acute fevers and inflammatory conditions. Morbid conditions of the urine include glycosuria or glucosuria, oxaluria, albuminuria, and phosphaturia.

Urinom'eter, an instrument for ascertaining the specific gravity of urine (q.v.). It is constructed on the principle of the hydrometer, and variations in the density of urine as detected by it are of great importance in the treatment of disease.

Ur'my, Clarence (Thomas), American poet and musician: b. San Francisco, Cal., 10 July 1858. He is an organist and choirmaster, and his songs and other verses deal with California themes. He has published 'A Rosary of Rhyme' (1884); 'A Vintage of Verse' (1897).

Urn, Cinerary. See URNBURIAL.

Urnburial, either the deposition of human ashes in a cinerary urn after cremation, or the enclosing of a dead body in two large urns placed mouth to mouth and sealed; both meth-

ods were employed in Grecian antiquity. The Grecian *pithos*, or wine jar, had a wide mouth, and in size and shape was like the large oil-jars of southern Europe. It was used as an urn to contain human ashes; and two such jars sometimes served as a rude coffin. Such coffins are found in ancient burying places in the Troad. See CREMATION.

Urochor'da. See TUNICATA.

Urode'la, or Gradientia, a division of amphibians (see AMPHIBIA) comprising those in which the tail persists in adult life. The skin is naked and soft, and an exoskelcton is rarely present. The body is elongated, and most of them have the four limbs well developed, but in some the posterior limbs are wanting. The order is conveniently divided into:

(1) *Perennibranchiata*, which retain the gills throughout life: including the American *Necturus*, the blind *Proteus* of the underground caves of Varniola in Dalmatia, and the eel-like *Siren* of North America.

(2) *Derotremata*, in which the gills are lost in the adult, but there is usually a persistent gill-cleft: including the newt-like *Cryptobranchus* and the eel-like *Amphiuma* from North America, and the giant salamander, *Megalobatrachus*, of China and Japan.

(3) *Myctodera*, the salamanders and newts, in which the gills are lost and the gill-clefts closed in the adult: including the common newts or efts (*Molge*), the spotted and black salamanders (*Salamandra*) of the European Continent, and the American *Amblystoma*, the sexually mature larva of which is the well-known axolotl.

Urquhart, ėr'ıı'art, **David,** Scottish political economist: b. Brackbanwell, Scotland, 1805; d. Naples, Italy, 16 May 1877. He was educated at Oxford, entered the diplomatic service and later traveled extensively in the East. He was secretary of the British legation at Constantinople in 1835-6, but resigned that position because of his opposition to the policy of Lord Palmerston, which he considered as subservient to the ambitions of Russia. He was member of parliament for Stafford in 1847–52 and maintained a vigorous opposition to Palmerston, his parliamentary attacks supplementing his writings for the press, and succeeding in instilling into the public mind a distrust of Russia's eastern policy. His works include: 'England, France, Russia and Turkey' (1835); 'The Spirit of the East' (2 vols., 1838); 'Progress of Russia in the West, North and South' (1853); 'Recent Events in the East' (1854), etc.

Urquiza, oor-kē'thä, **Justo José de,** Argentine soldier and politician: b. near Concepcion del Uruguay (now in Entre Rios, Argentina), 19 March 1800; d. there 11 April 1870. He was of mixed Spanish and Indian blood and during the war in La Plata in 1835–42 gradually rose in influence until he became a general of division under Rosas, dictator of Buenos Ayres. In 1844 he commanded the army sent against Uruguay, and in 1845, at the battle of India Muerte, he defeated Ribera. He was elected governor of Entre Rios in 1846, as leader of the federalist party. His administration of affairs was directed rather to his own glory and gain than to any benefit for the people, but he contrived to maintain a peaceful and prosperous condition of the country while strengthening his power, meanwhile acquiring great wealth. In 1851 he turned against Rosas, allied his forces with Brazil and Montevideo, and marched into Uruguay. He forced the capitulation of Oribe 8 Oct. 1851, then invaded Buenos Ayres, and on 3 Feb. 1852 defeated Rosas at Monte-Caseros. Urquiza was proclaimed provisional dictator and after the adoption of a federal constitution by the provinces (excepting Buenos Ayres) he was in 1853 elected president for a term of six years. In 1859 he forced Buenos Ayres to join the confederation, and after the expiration of his term of office took command of the army and endeavored to quell the revolt which had arisen in that country. He was defeated by Mitre at Pavon, 17 Sept. 1861, the result being the abandonment of the federalist constitution for the one since in force. He retired to Entre Rios, where he acted as governor, exercising semi-dictatorial powers, though nominally under the authority of the central government. In 1870 a formidable revolt arose, headed by his son-in-law, Gen. Lopez Jordan, and Urquiza was attacked in his palace and killed.

Ursa Major, ėr'sa mā'jor, or **Great Bear,** a northern constellation whose seven brightest stars are well known as Charles' Wain, as the Plow, the Dipper, and sometimes as the Butcher's Cleaver. Two of these seven stars are called the pointers, because they and the pole-star lie nearly in a right line, and these stars direct an observer to the pole-star. Ursa Minor, or Little Bear, a smaller constellation of the same configuration as Ursa Major, lies near the north pole.

Ur'sidæ, the family of the bears (q.v.).

Ursinus (ėr-sī'nŭs) **College,** located at Collegeville, Pa. It was incorporated in 1869, and was first opened to students in 1870; Freeland Seminary, whose property was purchased for the college, was incorporated into the college as its preparatory department; in 1871 a theological department was organized. The college is non-sectarian in its control, the board of directors being self-perpetuating; it is, however, affiliated with the Reformed Church in the United States, and the theological professors are ministers of that church. The organization of the college includes the College Department, the Academy, the School of Theology and the Summer Session. The School of Theology has been located in Philadelphia since 1898. The College Department offers six groups of studies, leading to the degree of A.B.; the groups are the classical, the Latin-mathematical, the mathematical-physical, the chemical-biological, the historical-political, and the modern language. The degree of A.M. is conferred for graduate work. In the School of Theology the regular course occupies three years; the curriculum, in addition to the ordinary theological curriculum, includes a lecture course in Sunday-school work, a complete course in the English Bible, a special course in the history of the Reformed Church, and a course in sociology; graduate courses are offered leading to the degree of B.D. The Summer Session offers courses of secondary and collegiate grade, work in the latter counting toward a degree. Women are admitted to all departments except the theological. The students in all departments in 1903–4 numbered 208, of whom 76 were in

the College Department and 36 in the Summer School.

Ursua, oor-soo'ä, or **Orsua, Pedro de,** Spanish soldier: b. Ursua, Navarre, about 1510; d. Machiparo, on the Upper Amazon, 1 Jan. 1561. He accompanied a Spanish expedition to New Granada, was governor of that country in 1545–6, and later led two expeditions from Bogotá in search of El Dorado. He commanded a force against the Cimarrones (fugitive slaves) on the Isthmus of Panama in 1555–7 and reduced them to subjection. In 1559 he was given command by the viceroy of Peru of an expedition to conquer the "kingdom" of the Omaguas, near the head of the Amazon. The purpose of the viceroy was really to rid himself of the unruly soldiers attracted to Peru by the civil wars. The ruse succeeded. Ursua adopted the title of "governor of Omagua and El Dorado" and set forth with several hundred of the turbulent soldiers in his train. He reached the Upper Amazon by way of the Moyobamba and the Ucuyali, but at Machiparo a conspiracy was formed among his followers, led by Lope de Aguirre, and he was murdered.

Ursula, ėr-sū'lą, **Saint,** virgin martyr, according to the legend, a daughter of a prince in Britain. She was put to death at Cologne by a horde of Huns, some say in 384, others in 453, together with 11,000 virgins who accompanied her. According to another reading the number of her companions was only eleven. The Roman martyrology mentions the saint and her virgin companions without stating their number. Some bones, said to be those of herself and her companions, are still shown to visitors. The day dedicated to her honor is the 21st of October. Saint Ursula was the patroness of the Sorbonne. Consult: Baring-Gould, 'Popular Myths of the Middle Ages'; Stein, 'Die heilige Ursula' (1879). See URSULINES.

Ursuline (ėr'sū-līn) **Convent and Academy of Saint Louis** (Mo.). Founded in 1848 by four sisters from Oedenburg, Austria, incorporated under the laws of the State of Missouri in 1884. It is one of the oldest houses of the order in the United States. They opened the school 2 Nov. 1848, in a small house on Fifth Street. In 1849 they were reinforced by six sisters from Landshut, Bavaria, and also received considerable pecuniary assistance from the Bavarian king, Louis I. Early in 1850 the city block bounded by 11th and 12th Streets and Russell and Ann Avenues, was purchased for them by Archbishop Kenrick, and extensive buildings — Convent, Academy, Day School — mark this their present location, whence band after band has since gone forth to found houses in other localities. In 1855 a colony of 12 set out for New York and established a house of the order at East Morrisania, N. Y. In 1859, in answer to an appeal from Bishop Juncker, seven sisters left the mother house to open a school at Alton, Ill. In 1877 another band went forth to plant the standard of education in the beautiful valley of Arcadia, Mo. Here they established an academy that bids fair to equal the one in Saint Louis in course of time. The Saint Louis community now numbers 160 members, and besides the flourishing academy and day-school connected with the mother house, the community supplies 16 parochial schools with teachers. These schools aggregate about 1,500 pupils — thus bearing out the motto of the institute: "*Mores Scientiaque.*"

Ursuline Sisters. See ORDERS, RELIGIOUS.

Urtica'ceæ, or Nettleworts. See NETTLE.

Urtica'ria, an inflammatory eruptive affection of the skin, also called hives and nettle-rash, the latter name referring to the resemblance of the wheals of urticaria to those caused by the sting of a nettle. The wheals are either rounded or elongated, appearing white at first, and afterward changing to red, the altered hue being more quickly assumed in consequence of rubbing or scratching to which the intense itching usually leads. Frequently urticaria follows upon gastric disturbance caused by eating certain fruits, shell-fish, or various other kinds of food. It may also be due to disorders of menstruation, to various functional irregularities, or to local irritations. Some of the balsamic drugs likewise give rise to it. The eruption appears and disappears suddenly in successive crops of wheals. In treatment it is necessary to evacuate the bowels and regulate the diet so as to restore the normal digestive condition, and cold-cream, glycerine, dilute acids, bichloride of mercury, etc., are useful locally. Salt-water baths are recommended for relief of the itching. For internal remedies salicylates and alkalies are administered, and by this means the severity of an attack may often be abated and its duration much lessened.

Uruguay, oo-roo-gwī' (REPÚBLICA ORIENTAL DEL URUGUAY), smallest of the independent countries of South America, is bounded on the north and northeast by Brazil, on the east by the Atlantic Ocean, on the southeast and south by the Atlantic Ocean and the estuary of the Rio de la Plata, and on the west by the Argentine Republic. Its territory extends from lat. 30° S. nearly to lat. 35° S., and the location of its principal city (or, more precisely, of the cathedral at Montevideo) is given as lat. 34° 54′ 33″ S., and lon. 58° 32′ 32″ W. Total area of the republic, 72,172 square miles.

Political Divisions.— The departments (with the population of each on 31 Dec. 1901, as shown by the official Boletín Estadístico Mensual for March 1902) are as follows: Artigas, 27,001; Canelones, 86,735; Cerro Largo, 37,236; Colonia, 51,563; Durazno, 38,111; Flores, 16,180; Florida, 45,248; Maldonado, 27,035; Minas, 37,152; Montevideo, 273,665; Paysandú, 44,411; Rio Negro, 23,127; Rivera, 25,349; Rocha, 30,428; Salto, 45,754; San José, 42,181; Soriano, 38,851; Tacuarembó, 38,789; Treinta y Tres, 25,800. See also sub-title "*Population.*"

Topography and Physical Geography.— The most elevated point in the republic is somewhat less than 2,000 feet above sea-level; the so-called mountains are, therefore, to be regarded rather as hills, which sometimes form chains — such as the Cuchilla Grande, which extends across the country, the Santa Ana range, between Brazil and Uruguay, the Cuchilla de Belén, and Cuchilla de Haedo,— but elsewhere give to the region, especially the northern districts, an irregular rolling or undulating surface. Forests or groves cover the hills in the north and generally extend along the banks of the numerous small streams (*arroyos*) and the larger water courses. The soil in the southwest is of uncommon fertility, being composed,

it is said, of detritus of great depth and rich alluvial deposits: the southeast and south have grassy slopes and good pasture lands, the hills here forming a bold line along the shore of the Rio de la Plata, but not extending to the Atlantic coast. For the dearth of good natural harbors, see La Plata, Rio de, and for a brief notice of the chief port, Montevideo. The small islands near the southern coast will be mentioned in a later paragraph. Important rivers, beside the great southern estuary, are: the Uruguay, which rises in the Brazilian state of Santa Catharina, and has a course of about 1,000 miles; and the Rio Negro, which also rises in Brazil, and empties into the Uruguay after flowing toward the southwest for about 350 miles. The latter passes through the centre of the republic; the former marks the boundary with Argentina; both are navigable for vessels of light draught (Rio Negro 55 miles, Uruguay 200 miles), and even large steamships navigate the Uruguay up to Paysandú. There are several shallow lakes, or *lagunas,* near the coast.

Mineral Resources.— It is impossible at the present time to offer a complete statement on this head. The production of gold in 1902 was 2,419 fine ounces, valued at $50,000. The hills and highlands are believed to be rich in minerals, and among the metals which have been found are mentioned (beside gold) silver, copper, iron, tin, and cinnabar. In the department of Minas, diamonds and topazes have been discovered; amethysts and agates have been exported to Europe. Deposits of coal are said to exist, but the quality remains to be ascertained. It is stated that the "silver ores yield 87 per cent of metal; copper ores, 56 per cent, and magnetic ores 72 per cent."

Flora and Fauna.— Hard and durable woods are: the ñandubay (which, instead of decaying when buried in the earth, becomes petrified), urunday, lapacho, coronilla, espinello, quebracho, arazá, algarroba, and lignum vitæ. Among the softer woods are the willow and acacia. Palms abound, and the poplar, pine, cypress, oak, eucalyptus, cedar, magnolia, and mulberry have been successfully acclimated. Yerba maté is indigenous, and 430 species of medicinal plants have been classified. As for animal life, the most interesting item is that relating to the seals, large numbers of which live and breed on the islands near the coast, especially Lobos and the Castillos group. More than three fifths of the seals at these rookeries are believed to be of the fur-bearing variety, and the islands are "strictly preserved," it is said, "no one being allowed to land upon them except the sealers — experienced men — during the killing month"; nevertheless 21,245 skins and 49,070 litres of oil were "produced" on Lobos and the Castillos group during the year 1901. The mainland fauna includes the deer, otter, wild hog, carpincho, fox, ounce, wildcat, ant-eater, etc. There are over 500 species of avifauna, including the crane, stork, swan, and wild turkey.

Agriculture and Stock Raising.— A marked increase is reported in the chief crops, with a single exception. Thus, in the fiscal year 1901–2, the production of wheat was 206,936,668 kilos, as compared with 99,719,771 kilos in 1900–1; of oats, 115,333 kilos, as compared with 68,334 kilos in the previous year; of barley, 1,016,441 kilos, whereas in 1900–1 only 438,263 kilos were produced; of flax, 8,757,245 kilos, or about three and one half times as much as in 1900–1; of corn, 128,539,335 kilos, as compared with 141,647,916 in the previous year. The cultivation of sugar-beets has begun, and refineries have been established. The largest sugar factory has been built by Belgian capitalists in the department of Maldonado. Statistics of 1902 show 24,266 farmers and tenants engaged in agricultural pursuits, nearly 2,000 being employed in the cultivation of vineyards. Statistics of 1901 to 1903, with reference to stock-raising, may be summarized as follows: live stock in the country, about 26,000,000 head, principally sheep and cattle. The relative importance of this industry will be indicated in the next paragraph.

Commerce.— The volume of foreign trade during recent years is shown in the following table:

Year	Value of imports	Value of exports
1893	$19,671,610	$27,681,373
1894	23,800,370	33,479,511
1895	25,386,106	32,543,644
1896	25,530,185	30,403,084
1897	19,512,216	29,319,753
1898	24,784,360	30,276,916
1899	25,652,788	36,574,164
1900	23,978,206	29,410,862
1901	23,691,932	27,731,126
1902	23,517,347	33,602,518

The foregoing figures are based upon customs valuations which, it is said, "average at least 30 per cent above real value" for imports; and the caution is added that "the same is true, though not to such an extent, of the exports" (Bulletin International Bureau American Republics, June 1903). The value of stock products and live stock exported was $25,992,817 in 1901, approximately $29,000,000 in 1902, and nearly $24,000,000 during the first six months of 1903. See also Exports and Imports of Latin-America.

Railways.— See South America.

Shipping, Roads, Telegraph, etc.— Vessels owned in Uruguay which are engaged in freight and passenger service number about 90. The activity of the chief port, harbor improvements, etc., are mentioned under Montevideo. The total length of the national and departmental roads is given as 5,340 miles; of telegraph lines, 4,604 miles; of telephone wires, 10,250 miles; of street railways, 103 miles. The total postal movement in 1902 was nearly 73,000,000 pieces. English, German, and French capital, which controls the large importing houses, has also nearly complete control of railways, telephones, and tramways.

Weights, Measures, and Money.— The *libra* = 1.0143 pounds; *arroba* = 25.35 pounds; *cuadra* = 2 acres (nearly); *suerte* = 2,700 *cuadras*; *fanega* = 3.888 bushels; double *fanega* = 7.776 bushels. The metric system has been officially adopted. Gold is the monetary standard; the unit is the *peso*, which has the value of $1.034 in United States currency. Practically, the medium of exchange consists of foreign gold coins and the silver peso and its divisions.

Government.— The legislative branch is composed of the Senate and Chamber of Deputies, the former having one member for each department (that is, 19 members), and the latter one for each 3,000 voters. The term of a senator

is six years, and that of a deputy is three. In most respects the powers of this Congress or General Assembly are similar to those of the Congress of the United States, but they extend much farther in certain directions, namely, to the granting of pardons and amnesties in extraordinary cases and electing the president of the republic (see below). The judicial power is exercised in several courts of first instance (distributed as civil, criminal, for cases affecting the treasury, for commercial cases, police, and departmental), courts of appeal, and the High Court of Justice. The executive power is vested in a president, who is chosen for a term of four years by a majority of the members of the legislature in joint session of its two chambers. The president is ineligible for re-election during two successive terms; he is aided by a cabinet of five, who are chiefs of the ministries of government, *Fomento* (Promotion of the Public Welfare), Finance, Foreign Affairs, and War and Navy. As in the United States, the vice-president is *ex officio* president of the Senate, Congress meets annually, etc. Each department has an administrative council whose members are chosen by popular vote, and a governor appointed by the national executive.

Finances.— The customs revenue for the year 1 July 1902 to 30 June 1903 was $9,928,935. In the budget for the fiscal year 1903–4, the principal sources of the government's income were scheduled as: customs revenue, $9,800,000; property tax, $2,000,307; business licenses, $1,040,000, etc. The sum (estimated) of the receipts was $16,371,516, exactly balancing expenditures. The debt of the republic, according to the '*Oficina de Crédito Público*,' was $123,843,694.95 on 30 June 1902.

Army and Navy.— On a peace footing the army formerly contained about 3,200 private soldiers and 232 officers; the national guard little more than 20,000. But these numbers were greatly increased in 1903–4, owing to the revolutionary movement (see below: *History*). The navy consists of three gunboats and a few auxiliary vessels.

Population.— The distribution of inhabitants in the several departments is shown above. The total population, including 9,961 transients, was 964,577 on 31 Dec. 1901: increase in that year 28,457.

Education and Religion.— In addition to the establishments for higher education at Montevideo (q.v.), there are in the republic about 600 elementary free schools, with about 55,000 pupils and 1,160 teachers; 332 private schools, with about 880 teachers; also many religious seminaries. The religion established by the constitution is the Apostolic Roman Catholic, but all other forms are tolerated, and the financial aid given by the government to the Church is small.

History.— On 8 Oct. 1515 Juan Diaz de Solis sailed from Spain; he explored the estuary of the Rio de la Plata, and was slain, with some of his companions, by natives of the Charrua tribe. On 2 Feb. 1520 Magellan sailed from the Rio de la Plata, after having explored the Paraná and Uruguay rivers in his search for a waterway across Terra Firma. On 1 April 1526 Sebastian Cabot set out from Seville; he ascended the Paraná to the great falls and the Paraguay to the mouth of the Bermejo. In 1527 Cabot ordered the construction of a fort in the country east of the Uruguay River. The opposition of the natives to the Spanish settlements was fierce and, during a century, successful: in 1603 a veteran Spanish force was routed in a pitched battle by the Charruas. In 1624 the oldest of the towns which now exist in Uruguay was founded on Rio Negro. The so-called "Banda Oriental" (that is to say, the region east of the Uruguay River) was the subject of contention between Portugal and Spain. In 1680 the Portuguese colonists of Brazil founded Sacramento (now Colonia), thus confronting the Spaniards at Buenos Ayres. In 1723 the Portuguese fortified the Bay of Montevideo, but surrendered to the Spaniards in the following year, and families from Buenos Ayres established themselves at Montevideo in 1726. In 1735–7 Colonia was besieged by the Spaniards. In 1761 it capitulated, but was restored to Portugal by the Treaty of Paris, 1763. This did not put an end to Spanish colonization there; on the contrary, immigration from the north of Spain and from Spanish settlements across the river continued throughout the 18th century. For the capture and abandonment of Montevideo by English forces, see La Plata, Rio de, and Montevideo. On 26 April and 28 May 1811 José Artigas, leader of the revolutionary party in the Banda Oriental, routed the Spanish forces; a confederation of the settlements east of the great river was formed, with Artigas as "Protector." But the Portuguese captured Montevideo and Maldonado, and in 1822 the region in dispute was organized as the Cisplatine Province of Brazil. Artigas took refuge in Paraguay, where he died. Other refugees, however, who had gone to Buenos Ayres, returned to start a rebellion in the Cisplatine Province, and on 23 Aug. 1825 issued a declaration of independence. On 24 September and 12 October in the same year the Brazilians were defeated. Then the Argentine government intervened. On 9 February and 30 July 1826 Admiral Brown, commanding the Argentine squadron, failed in his attempts upon the Brazilian fleet; but in February 1827 succeeded in destroying the expedition sent by the Brazilian admiral Lobo into the Uruguay River, and on the 20th of that month the Marquis of Barbaceno, commanding Brazilian forces, was defeated at Ituzaingo. On 27 Aug. 1828 the Treaty of Montevideo was signed, and the *República Oriental del Uruguay* was created, both Brazil and Argentina renouncing their claims to the country thenceforth to be known as the Eastern Republic of the Uruguay, or simply Uruguay. On 18 July 1830 the constitution was adopted, and a new declaration of independence issued — this time guaranteed by both of the strong neighboring states. But, unfortunately, from that day to this the political parties — the "Colorados," or Reds, and "Blancos," or Whites — have kept alive the traditions of home-bred strife. Thus, in 1842, a political chief secured Argentine support, and laid siege to Montevideo; in 1862 ex-President Flores, "Colorado" leader, made use of Brazilian troops to take Paysandú. On 25 Feb. 1865 Flores with his Brazilian allies took forcible possession of the capital and of the government; quite naturally, therefore, Uruguay was drawn into the

coalition formed to resist the dictator of Paraguay, Francisco Lopez (see PARAGUAY and DICTATORSHIPS IN LATIN-AMERICA). On 17 Aug. 1865 Flores defeated a division of Paraguayans at Yatay; three years later he was assassinated during a "Blanco" rebellion at Montevideo; and ex-President Berro, "who, though not one of the assassins, was arrested in the street with arms in his hands," was executed, with other rioters. The revolution of 1870–3 ended in a "Colorado" triumph. Of the long series of disturbances which have followed, marking the efforts of "Blancos" to regain power, only the last need be mentioned at present — the serious revolution which broke out in March 1903, and continued in 1904, despite the increased military force of the government.

Consult: Burmeister, 'Reise durch die La Plata-Staaten'; 'Códigos y Leyes Usuales de la República Oriental del Uruguay' (2 vols., Montevideo 1894); 'Handbook of Uruguay,' and other Bulletins of the Bureau of American Republics.

MARRION WILCOX,
Authority on Latin-America.

Uruguay, a river of South America, rising on the coast range of southern Brazil, flowing first west on the boundary between the states of Santa Catharina and Rio Grande do Sul, then southwest between the latter state and Argentina, and finally south between Argentina and the republic of Uruguay, emptying into the head of the estuary of La Plata. Its main head stream in Brazil is called the Pelotas. It is over 1,000 miles long, and an important avenue of commerce, passing the towns of Salto, Paysandú, and Concepción. It is navigable for the large steamers to Paysandú, and for smaller vessels to the rapids above Salto, above which it can again be navigated for several hundred miles.

Urumchi, oo-room'chē, Central Asia, a city of Chinese Sungaria, in the province Sin-kiang, on the northern side of the Tyan-Shan Mountains. It consists of an old and a new town, the former being situated on the slope of a mountain which attains a height of 14,000 feet above sea-level. It was formerly of great commercial importance in the trade between Russia, Turkestan, and India. Urumchi is of strategic importance and is now the administrative and military capital of the province of Sin-kiang. Pop. estimated at 15,000.

Urumia, oo-roo-mē'ä, **Urumiah,** or **Urumiyah,** Persia, (1) A town in the west of the province of Azerbijan, situated on an extensive plain about 10 miles west of Lake Urumia and 65 miles southwest of Tabriz. It claims to be the birthplace of Zoroaster, and in the vicinity are several mounds, supposed to have been made use of in the ceremonies of the ancient fire-worshippers. The surrounding district is of great fertility, covered with groves, orchards, vineyards, gardens, rice-grounds, and villages. Pop. about 30,000. (2) The lake, situated 4,300 feet above sea-level, is about 80 miles long from north to south, by 20 miles broad and has no apparent outlet. It is very shallow throughout. Numerous islands are scattered over its surface. Its waters are so salt that neither fish nor mollusca can live in it. Salt of a good commercial quality is obtained from shore deposits, the result of natural evaporation.

U'rus, a kind of large ox which ran wild in Gaul at the period of the Roman invasion, as described by Cæsar. See OX; WHITE CATTLE.

Usage, in law. See COMMON LAW.

Usambara, oo-zäm-bä'rä, German East Africa, a mountainous district in the northeastern part of the colony, bordering on the coast to the northwest of Zanzibar. It is extremely fertile, and one of the most important parts of the colony.

Usbegs, or **Usbecks.** See TUAREGS.

Use, in English law, the benefit or profit of lands and tenements that are in the possession of a person who simply holds them for another person, the real beneficiary. He to whose *use* or benefit the trust is intended, enjoys the profits, and is called *cestui que use.* All modern conveyances are directly or indirectly founded on the doctrine of *uses* and *trusts,* which has been deemed the most intricate part of the property law of England.

Use and Disuse, one of the doctrines in that view of organic evolution promulgated by Lamarck (q.v.) which holds that variations in structure are brought about by the use, in the one case, or by the disuse, in another, of organs. Conceding that physical changes due to such a cause may be brought about in the individual, the important question remains — are they inheritable? Hence, a correlated part of the theory must be disposed of under the name "Use-inheritance." Followers of Lamarck are believers in the efficacy of use and disuse and use-inheritance as factors in evolution. Consult the writings of Lamarck, Packard, Cope, Hyatt, Weismann, etc. See EVOLUTION; HEREDITY; LAMARCKISM.

Usedom, oo'zĕ dŏm, Prussia, one of the two islands which separate the Stettiner Haff from the Baltic Sea, six miles southeast of Rügen. It is of irregular shape, 34 miles long, and ¼ to 15 miles wide. Agriculture, cattle-raising and fishing are the chief occupations. The chief town is Swinemünde. Pop. about 30,000.

U"serte'sen, or **Userten** (known to the Greeks as SESORTOSIS), the name of several Egyptian kings of the ancient royal house of Thebes. They belonged to the 12th dynasty, and reigned between 2130 and 1930 B.C. Usertesen I. erected at Thebes the earliest and loftiest of the obelisks, which measured about a hundred feet from apex to base. His colossal statue in red granite has been discovered near Tunis. Usertesen II. and III. completed the subjugation of Lower Nubia.

Ushant, ŭsh'ant (French, OUESSANT, wĕs-sŏñ), France, an island 15 miles off the west coast of the department of Finistère, to which it belongs; area, six square miles. It is almost entirely composed of granite, with a bold and rocky coast, which is accessible only at some points. Fishing and the rearing of sheep are the principal occupations of the inhabitants. St. Michel is the chief village. Ushant, with the surrounding islets, forms a commune having a pop. of 2,377. Near the island in 1759 Sir Edward Hawke defeated Admiral Conflans and in 1778 Admiral Keppel and Count D'Orvilliers fought an indecisive battle.

Ush'er, Hezekiah, American bookseller: b. England about 1615; d. Boston, Mass., 14 March 1676. Thomas ('History of Printing' 1810) calls him "the first bookseller in English America of whom I can find any account." He was in Cambridge as early as 1639, but in 1646 set up business in Boston. As agent of the Society for the Propagation of the Gospel, he purchased the types and paper for the printing of Eliot's 'Indian Bible' (see ELIOT, JOHN), and directed all the transactions in connection therewith. This was the first Bible printed in the colonies. Usher was a founder of the Old South Church of Boston (1669).

Usher, or Ussher, James, Irish prelate, Archbishop of Armagh: b. Dublin 1581; d. Reigate, Surrey, 1656. He took orders in 1601, and in 1607 was appointed professor of divinity at Trinity College, Dublin, and chancellor of St. Patrick's cathedral; in 1620, bishop of Meath; in 1623, Irish privy-councillor, and primate of Ireland in 1624 as archbishop of Armagh. His notions of church government verging toward Presbyterianism, his enemies took advantage of this to attempt to destroy his credit with James I.; but he enjoyed to the last the esteem of that king. He attended Strafford in prison and at his execution. During the civil war he was a stanch adherent of Charles I., and witnessed the execution of the king. After that event he experienced civility and flattering promises from Cromwell, who finally ordered that he should be buried in Westminster Abbey. Archbishop Usher carried on an extensive correspondence with the learned in various parts of Europe, and was a man of great erudition. He wrote a number of works, the principal of which are the 'Annals of the Old and New Testament,' which forms the basis of the biblical chronology in King James' version of the Bible; 'Britannicarum Ecclesiarum Antiquitates.' Consult: Aikin, 'Lives of Selden and Usher' (1812).

Usher, John, American colonial executive: b. Boston, Mass., 27 April 1648; d. Medford, Mass., 1 Sept. 1726. He was son of Hezekiah (q.v). As a bookseller he was the first in the colonies to obtain a copyright for printing, the work being a revised edition of the laws of Massachusetts. He was colonel of militia, treasurer of Massachusetts, and agent in London for the Massachusetts colony for the purchase from Sir Ferdinand of Gorges or the title for the district of Maine (1677). In 1692–7 he was lieutenant-governor of New Hampshire, and again from 1702 till his death.

Uskup, oos'kŭp, Skopia, or Skoplie, European Turkey, the capital of a sanjak in the vilayet of Kosovo, situated on the river Vardar, 120 miles northwest of Saloniki, on the railroad from Saloniki to Belgrade and the branch line to Mitrovitza. It has a handsome mosque, a castle, a Byzantine aqueduct, and a recently established trade-school. The chief manufactures are leather, metal ware and cloth, and the town is an important trade centre for grain, wool and fruit. Pop. 20,000.

Us'nea, a genus of fruticose lichens, attached only in one place, with a shrub-like appearance. They are often pendulous, as is the old man's beard (*U. barbata*) which hangs in long tassels and festoons from the bark of trees or their branches, is gray-hued, and resembles somewhat in habit the *Tillandsia. Usnea* is also known as necklace-moss, or hanging moss.

Uspallata (oos-päl-yä'tä) Pass, Chile, a pass over the Andes between Chile and Argentina, 90 miles east of Valparaiso, and at the southern base of Mount Aconcagua. Its highest point is about 12,800 feet above the sea, and the Trans-Andine Railroad passes over it.

Ustica, oos'tē-kä, Italy, a small island in the Tyrrhenian Sea, 40 miles north of Palermo, Sicily. It is three miles long and two miles broad, and has a fortified harbor with a lighthouse. Pop. (1901) 1,992.

Us"tilagin'aceæ, the family of minute fungous plants called smuts. See FUNGI.

Usufruct, the most important of personal servitudes, servitude being the term for the right to use the property of another, whether real or personal. It may be established in any property which is capable of being used so far as is compatible with the substance of the thing not being destroyed or injured. This right may either be exercised directly, or may be leased or sold. The one possessing it is termed the usufructuary. The usufructuary is bound not to impair the property, and must furnish security for the restoration of it. A *quasi-usufruct* is recognized in the case of certain perishable things, or "consumptibles." In such case the equivalent in kind and quantity, or in value, is held to represent the things destroyed or impaired by use. There are works on the subject by Genty (1859) and Hanausek (1879).

Usumacinta (oo-soo-mä-sēn'tä) River, Central America, formed by the junction of three head streams, the Chixoy, Pasion, and Lacantum, rising in Guatemala, for some distance in its middle course constitutes the frontier line between Guatemala and Mexico. It flows northwestward through the states of Chiapas and Tabasco, Mexico, and joins the Tabasco near its mouth, after a course of about 400 miles. A navigable branch also flows eastward into the Laguna Terminos, opening into the Gulf of Campeachy.

Usury. If the term "usury" is to be defined, as in the strictly legal sense, as the illegal profit required by a lender for the loan of money or other property, it will be found that this offense against society is almost as old as society itself. Even in the earliest of Biblical days, for example, usury was practised so generally that the Lord uttered his warning against the custom: "Thou shalt not lend upon usury to thy brother, usury of money, usury of victuals, usury of anything that is lent upon usury; but unto thy brother thou shalt not lend upon usury, that the Lord thy God may bless thee" (Deut. xxiii. 19, 20.) And yet, while in this sentence, every kind of interest is blended together and the natural principles of economics are merged inseparably with the moral and religious law, the fact remains that until comparatively recent times the word "usury" had many definitions and was used to embrace several essentially different social phenomena. In the Old English application it denoted any sort of interest upon money loaned rather than in the more modern signification which has made it applicable only to the unlawful contract exacting that the loan of money be repaid with exorbitant interest for its use. In fact, if one were to

trace the history of the word back through the centuries that have passed since the Mosaic days it would be found that it had as often been applied to the strictly moral and legal methods of procuring just interest for capital invested as to those concerning which a moral if not a legal taint might be attached.

History.—The earliest interpreters of the laws of Moses certainly condemned the illegal practice of usury, and yet they did not forbid the taking of interest in payment for the loan of money, but expressly stipulated that such interest should be charged to strangers. It must be admitted, however, that this reading of the law was largely the result of the social conditions which existed in Israel at this time. In the first place the Israelites were neither a rich nor a commercial people, and the laws and regulations under which they lived were apparently not framed with the purpose of enabling them to become so. Their object, therefore, was to maintain their entity as a nation and to preserve the family inheritances which enabled them to continue happily their frugal mode of life. If the Israelites borrowed, therefore, it was not with a view to profit or to enable them to improve their condition, but simply from poverty and to secure to them some absolute necessity of life. To exact from such persons more than was lent, therefore, would have been both sinful and unjust. The result is denoted by the fact that among the ancient Israelites loans were made merely in cases in which there were poor persons who required assistance to tide them over present difficulties, and never for the purpose of enabling an avaricious man to increase his wealth at the cost of the sufferings of his poorer neighbor. This restriction, however, did not apply in the case of the stranger who was in need of financial help, and the extortion of usury was one of the several means resorted to by the Israelites to ruin the Canaanites and the other stranger-people who remained in the land.

As time passed the public attitude toward usury underwent a decided change, and society, which had branded all lending as immoral and all interest as "usury," because the lending had so generally resulted in cruelty and hardship to the borrower, finally began to feel that all lending was moral and honest, and it was under these conditions that the term "usury" was first applied to every method of receiving interest upon capital invested, an attitude that remained unchanged for many centuries.

One of the most interesting and instructive features in the study of the economic progress of society is that which enables one to follow the various changes that have occurred in the methods of money lending. It has already been shown that the ancient Israelites borrowed only from necessity and not from the possibility of furthering any commercial interests, and this condition, according to Grote, not only prevailed in Greece, but applied to nearly all parts of Europe during the early Middle Ages. In the third volume of his 'History of Greece,' he says:

"It is worthy of remark that the first borrowers must have been for the most part men driven to this necessity by the pressure of want and contracting debt as a desperate resource, without any fair prospect of ability to pay; debt and famine run together in the mind of the poet Hesiod. The borrower is in this unhappy state rather a distressed man soliciting aid, than a solvent man capable of making and fulfilling a contract; and if he cannot find a friend to make a free gift to him in the former character he would not, under the latter character, obtain a loan from a stranger, except by the promise of exorbitant interest and by the fullest eventual power over his person which he is in a position to grant."

In its inception the economic theory of the loaning of money did not contemplate the possibility that anyone might desire to raise a loan for the purpose of investment or to secure capital with which to carry one's business interests to a more successful outcome. In these early ages the commercial sense had not been widely developed and such business interests as those represented by the modern banker and broker were unknown, a condition that was not unfavorable to the extension of the practice of usury whenever and wherever there were laws permitting it. These ancient laws relating to loans read strangely to the modern student and can scarcely be comprehended if they are not considered in connection with the conditions of the times. If the Mosaic laws are taken as an example, the reader must place himself in a position to appreciate the Biblical point of view before he can hope to approximate fairly their justice to both borrower and lender. It must be remembered that the land (that is, the world) belonging originally to its creator, had been given by God to the descendants of Abraham, and liberality to the poor had been one of the conditions under which this gift had been made. Naturally, therefore, the needy Israelite felt that obtaining loans was a right which belonged to him, while the more wealthy people of Israel, feeling that all their property was a loan direct from the hand of God, did not, in the beginning at least, object to giving a small portion of their plenty for the relief of the destitute. Under such conditions it may clearly be seen that the execution of this law of lending was supported by all the force that the recommendation of the constitution itself could bring to bear upon it, and it was not until the selfishness of man commenced to exert a baneful influence that definite laws were promulgated, laws that made the duty of lending the express command of God. While the justice of such legislative enactments may be questioned, especially when viewed from the position of present-day society, their benignity is no longer a matter of doubt when the principle of the divine origin of property is accepted as the basis of ownership, and as this was the polity upon which the entire Mosaic commonwealth was constructed, the laws adopted for the government of the borrower and the lender assume a more just and reasonable position in the estimation of modern thought. In substance these laws provided that the destitute Israelite might borrow what he required for his necessities without interest, either in money or produce; at the end of each seven years there was a remission of debts when every creditor was supposed to remit such money or produce as he had lent, and a prospective borrower was not to be refused such necessities as he might require even when the year of the remission was at hand. While the Mosaic law strictly forbade the charging of interest, it did not prevent the

acceptance of pledges, yet even these pledges were legally protected in such manner as to prevent the possibility of any hardship falling upon the borrower. For instance, the lender was forbidden to accept a mill or the upper millstone in pledge, it being held that they were too much a necessity of life; if raiment should be taken it was required that it must be returned before sunset, lest it be needed during the night, while in the case of a widow's raiment, its acceptance was forbidden under all circumstances. Under the Mosaic law a creditor was forbidden to enter a house for the purpose of reclaiming a pledge, although he might stand without until the borrower should come to him and return it, and while the statutes did not prohibit temporary bondage in the case of insolvent debtors, they provided that the Hebrew bondsman should not be held longer than the year of jubilee, or the 7th year at the most.

If these were the laws that governed the financial relations of Israelites among themselves, however, the same leniency did not apply to the Israelite's treatment of the stranger. For example: interest might be taken from a foreigner, and, at the end of the 7th year, the principal as well as the interest might be exacted. Less restrictions were placed upon pledges taken from foreigners, and the foreign debtor held in bondage was not entitled to exact his release at the coming of the jubilee, and yet, even these laws were humane in comparison to those of Rome which not only provided for the enslavement of the debtor, but even permitted the creditor to put him to death, an extremity, however, to which, according to the best authorities, the Romans were never known to have resorted.

The provision of the Hebrew law which permitted the lender to collect both principal and interest from a stranger and which placed the stranger at the mercy of the creditor until such loans were repaid was the beginning of the practice of usury among this people, but many centuries elapsed, as is shown by reference to Proverbs, or to the Psalms, before the exaction of usury from another Hebrew was regarded otherwise than as a discreditable act. By the time of the birth of Christ, however, the original spirit of the law seems to have been forgotten, for the borrowing and lending of money then prevailed without regard to any race limitations.

The practice of mortgaging land and of paying exorbitant interest for money obtained upon such surety was a Jewish custom which grew up during the days of the Captivity. Although condemned by Nehemiah as being in direct violation of the law, and denounced by Jesus Christ, whose new law of love required the righteous man to give to all who asked of him, and to lend to his enemies, "asking for nothing again," the mortgaging of property has continued throughout the East. In the beginning, and for a long period, 12 per cent was generally the interest charged, but later, under Turkish rule, and despite the warnings of the Koran, which also forbids usury, from 40 to 50 per cent was exacted.

In ancient Greece the practice of usury prevailed to such an extent that in Athens, about 595 B.C., the bulk of the population were bound in practical slavery. Originally free, and small proprietors, they had continued to borrow from the rich until the majority of them had placed themselves completely at the mercy of the aristocracy, and even those who nominally owned their land were not only unable to pay the money they owed but were compelled to erect on their land huge stone pillars, monuments to advertise their debts, which bore the name of the plutocrat to whom they were so seriously indebted. At last Solon appeared and with him the reform legislation that made Athens once more a free city, for the radical remedy which he applied to the financial abuses formally put an end to the law of bankruptcy resting upon slavery, and practically overcame the evil effects of the entire system of usury. Realizing that such a serious condition required a firm hand, Solon first proclaimed a general *seisachtheia,* which provided that all debts made upon the person of the debtor or upon the surety of his land should become void. At the same time his legislation stipulated that bodily security should never again be accepted and that surety in land should rest only within a portion of the property. These reforms, which were certainly distinctly modern in their character, were so effective that the evils which had once threatened the security of Athens were no longer experienced, and although the rate of interest charged upon loans was still sometimes exorbitant — a condition which must exist whenever the rate is left to be determined by free contract — the restriction of the right of attachment was the means of preventing many abuses.

The conditions which existed in Rome during the early days of the nation were similar to those which prevailed in Greece, although in Rome there was no Solon to legislate reform measures that could really reform. As the result more than five centuries passed before the Roman debtor was accorded the relief that had saved Athens, and, by that time, it was too late for any legislation to preserve the identity of the middle class. In the beginning Rome resembled Athens in that the mass of its people were farmers living on their own small estates, and, as in Athens, these yeomen soon became overwhelmed by the debts that war and taxes had forced upon them. A protest was made and, in 500 B.C. the Twelve Tables were adopted as a remedy, the theory being that the stipulation of a maximum rate of interest would be all that was necessary to overcome the prevailing evil. So far from accomplishing this purpose the attempt to regulate the rate of interest failed utterly and as no alterations had been made in the laws which actually governed debt, it was less than three centuries before practically all the free farmers had become enslaved. It was not until the dictatorship of Julius Cæsar, in fact, more than five centuries after Solon, that the Athenian remedy was adopted and the law of debt really abolished. It has been stated that, at this time, while the rate of interest upon first-class properties in the city of Rome was only about 4 per cent, in the provinces the rate was increased to 25 and often 50 per cent. After pronouncing the accumulation of arrears illegal, Justinian established a rate of 6 per cent for all loans except those of a mercantile character, in which case 8 per cent was allowed, and public sentiment, at last aroused to the influence of usury upon the social and economic fabric of the nation, stamped it as such a pernicious crime that when Cato was asked what he thought of

the practice (usury) he made no other answer to his questioner than to ask him what he thought of murder.

Forbidden by legal enactment and condemned by the moralists it was but natural that the practice of usury should be just as severely censured by the Fathers of the early Church. They not only held the custom up to detestation, but they passed regulations prohibiting a usurer from obtaining ordination, while the Council of Nice, one of the many councils which took action upon the subject, carried its decree to such an extent as to stipulate:

"Forasmuch as many clerks, following covetousness and filthy lucre, and forgetting the Holy Scriptures which speaks of the righteous man as one that hath not given his money upon usury, have let forth their money upon usury, and taken the usual monthly increase, it seemed good to this great and holy synod that if anyone, after this decree, shall be found to take usury, or demand the principal with half the increase of the whole, or shall invent any such methods for filthy lucre's sake, he shall be degraded from his order and have his name struck out of the roll of the Church."

During these times usury was described as of various kinds. If it was called *centesimo*, it meant that a hundredth part of the principal was required to be paid every month; a practice permitted by law but forbidden by the Church. If called *sescuplum*, it implied the whole and half as much more, which was condemned both by the Church and by a law of Justinian. The only forms of usury permitted both by law and the Church were those which called for less than one half of the centesimal interest, while the importance of ecclesiastical disapprobation in such matters is shown by the fact that all the decrees of the Apostolic Canons; the Council of Eliberis; the first and second councils of Arles; the first and third councils of Carthage; the Council of Nice, and the Council of Laodicea and of Trullo, had great effect in discouraging the practice of usury among the Christian races.

The natural consequence of this general condemnation of usury by the highest tribunals of the Church was the excuse for the adoption of the usurious methods by the Jews. In their case the laws prohibiting extortionate interest had so far become a dead letter that the race question was never considered when the matter of the loaning of money was under discussion. Had the Jews still adhered to the ancient Mosaic law, however, its provisions which permitted them to charge interest to the stranger and to collect both principal and interest from him under the most extreme penalties for failure to meet such obligations, would have been sufficient authority for them to have become the money lenders of Europe. Moreover since the beginning of the Christian era the term "usury" had also been applied in the sense of receiving a reasonable rate of interest for the use of money loaned and as this had long been regarded as an allowable practice, one which was no more contrary to the Hebrew law of love than the ordinary acts of buying or selling merchandise for gain, they felt themselves at perfect liberty to enter this field of commerce which had so conveniently been deserted by the Christians. That they often abused their privileges and conducted their business in a manner that was far from consistent with the Hebrew principles of equity even when applied to the stranger, is, of course, beyond question; but these were the abuses of a system which time had made necessary and it was such abuses that have been responsible for much of the Jewish persecution which has darkened so many of the pages of history, for it was undoubtedly largely on account of their practice of money-lending and the determination shown by them in the collection of the last penny of both principal and interest that made the race so heartily detested and liable to such gross ill-treatment at the hands of the people. An interesting illustration of this popular animosity was exhibited at the time when Henry III. granted the charters to Newcastle and Derby, for by these documents Jews were forbidden to live in either place, and, as late as 1290 they were expelled in a body from the kingdom and were not permitted to return until the days of Cromwell, in spite of the fact that, long before their banishment, Christians had already commenced to accept interest upon money loaned and that the business of money lending had ceased to be exclusively a right of the Jews.

The history of usury in England begins during the reign of Edward the Confessor, for it was at this time that the exaction of exorbitant interest was first prohibited. By 1126 that law had so far become obsolete that the practice of usury was forbidden only to the clergy. In 1199, Richard I. decreed that the rate of interest should be restricted to 10 per cent and this remained the legal rate until 1624, when it was reduced to 8 per cent. In 1651 a still further reduction to 6 per cent was made, and, in 1714, the rate was established at 5 per cent, remaining unchanged until 1833, when, during the reign of William IV., bills not having more than three months to run were exempted from the operation of the laws against usury. Under Victoria this exemption was extended to bills payable in 12 months, and, later, it was enacted that bills of exchange and forbearances of money above ten pounds should not be affected by the usury laws. At present the legal rate of interest in Great Britain is 5 per cent, unless it can be shown that a different rate was agreed upon between the contracting parties.

Usury in the United States.— Usury was one of the subjects which received early attention at the hands of the legislatures of the various States. In most instances the crime is defined as "the illegal profit required and received by the lender of a sum of money from the borrower for its use. To constitute a usurious contract it is required that there be a loan under an agreement that the money shall be returned to the lender, together with interest greater than that fixed by law." Of course, the laws in relation to usury vary under the statutes of the different States, but, in almost every case, by the addition of a bonus to the interest in which the sum is greater than the legal interest, the contract is held to be usurious, and, in the absence of any statute regarding such usury, relief may be obtained through courts of equity. In every State, however, care has been taken to distinguish between usury, applying the word in the modern sense of "unjust exaction," and interest on capital, for the progress of society has been in such a direction that the position of borrower and

lender has now assumed an entirely different aspect. To-day the borrowing for commercial purposes represents transactions of overwhelming importance to the financial world, whereas the act of borrowing for purposes of necessity has become comparatively unimportant. As the result circumstances have so changed that the old laws would be useless in dealing with any present day usury evil, and the statutes enacted by the various States are of the character which seems best fitted to cope with the conditions of the times.

These laws, briefly summarized for tabulation, are as follows:

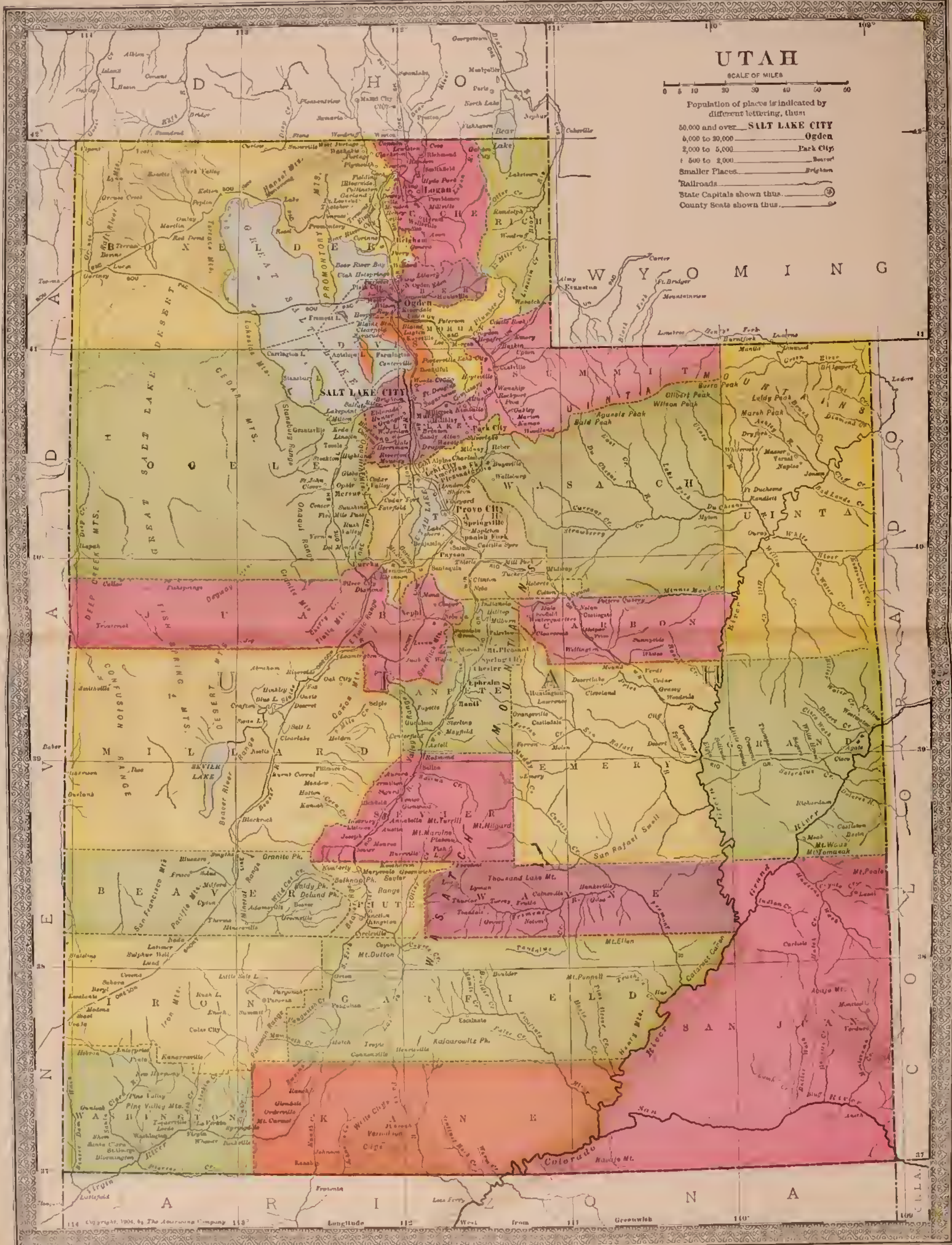
THE USURY LAWS OF THE UNITED STATES.

States	Legal rate of interest Per cent	Interest allowed by contract Per cent	Penalties for usury
Alabama	8	8	Forfeiture of interest.
Alaska	8	10	Forfeiture of double amount of interest.
Arizona	6	Any rate	No provision.
Arkansas	6	10	Forfeiture both principal and interest.
California ...	7	Any rate	No provision.
Colorado	8	Any rate	No provision.
Connecticut ..	6	Any rate	No provision.
Delaware	6	6	Forfeiture of principal and interest.
D. of Colum..	6	10	Forfeiture of interest.
Florida	8	10	Forfeiture of interest.
Georgia	7	8	Forfeiture of excess interest.
Hawaii	6	12	Forfeiture of interest.
Idaho	7	12	Forfeiture of interest and 10 per cent of principal.*
Illinois	5	7	Forfeiture of interest.
Indiana	6	8	Forfeiture of excess interest.
Indian Ter...	6	8	Forfeiture of interest.
Iowa	6	8	Forfeiture of interest.
Kansas	6	10	Forfeiture of double the amount of usurious interest.
Kentucky	6	6	Forfeiture of excess interest.
Louisiana	5	8	Forfeiture of interest.
Maine	6	Any rate	No provision.
Maryland ...	6	6	Forfeiture of interest.
Massachusetts	6	Any rate†	No provision.
Michigan	5	7	Forfeiture of interest.
Minnesota ...	6	10	Forfeiture of principal and interest.
Mississippi ...	6	10	Forfeiture of interest.
Missouri	6	8	Forfeiture of lien.
Montana	8	Any rate	No provision.
Nebraska	7	10	Forfeiture of interest.
Nevada	7	Any rate	No provision.
N. Hampshire	6	6	Forfeiture of three times the amount of excess interest.
New Jersey .	6	6	Forfeiture of interest and costs.
New Mexico..	6	12	Forfeiture of twice the amount of excess interest.
New York ...	6	6‡	Forfeiture of principal and interest.
No. Carolina.	6	6	Forfeiture of interest.
North Dakota	6	8	Forfeiture of excess interest.
Ohio	6	8	Forfeiture of all interest over 6 per cent.
Oklahoma ...	7	12	Forfeiture of interest.
Oregon	6	10	Forfeiture of principal and interest.
Pennsylvania	6	6	Forfeiture of excess interest.
Rhode Island.	6	Any rate	No provision.
So. Carolina..	7	8	Forfeiture of interest and liability.§
South Dakota.	7	12	Forfeiture of interest.‖
Tennessee ...	6	6	Forfeiture of excess interest.
Texas	6	10	Forfeiture of interest.
Utah	8	Any rate	No provision.
Vermont.....	6	6	Forfeiture of excess interest.
Virginia	6	6	Forfeiture of interest.
Washington	6	12	Forfeiture double the accrued interest and costs.
West Virginia...	6	6	Forfeiture of excess interest.
Wisconsin.....	6	10	Forfeiture treble the amount of usurious interest.
Wyoming	8	12	Forfeiture of interest

* Which sum reverts to the school fund; † not more than 18 per cent can be collected on loans of less than $1,000; ‡ on call loans of $5,000 or upward any rate of interest may be charged; § embraces liability to separate action to the extent of double the amount of usury; ‖ in this State usury is regarded as a misdemeanor.

JOHN R. MEADER,
Editor 'American Year-Book.'

Utah, ū'ta or ū'tâ, a State named after the Ute tribe of Indians, whose habitat was here, lies between lat. 37° 42′ N. and lon. 109° 114′ W., comprising an area of about 84,000 square miles. The country is crossed, mostly from north to south, by mountain ranges; the principal one is the Wasatch Range, which might be termed the backbone of the State. East of this natural wall is the region drained by Green and Grand rivers, affluents of the Colorado, while to the west is the Great Salt Lake (q.v.), otherwise known as the "Dead Sea of America," and its contiguous desert. This lake, extending north and south for 80 miles, with a width of over 30 miles, and an extreme depth of 60 to 75 feet, lies in the very heart of the vast arid intermountain plateau named the "Great Basin" (q.v.), whose eastern rim is the Wasatch Mountains, and its western limit, the Sierra Nevada Range. The lowest point of altitude in Salt Lake Valley is 4,210 feet above sea-level. Utah Lake (q.v.), a smaller body of fresh water, 40 miles southward, is connected with the Salt Lake by Jordan River, a circumstance which, with the general lay of the country, induces a comparison between Utah and the land of Palestine. Broken mountain chains in central, eastern, and southern Utah alternate with valleys and plateaus, while few and far between are fresh lakes and rivers, owing their existence mainly to the melted snows flowing in crystal torrents from the rugged gorges of the towering snow-capped hills. A dearth of moisture, and a consequent scarcity of timber and verdure, have been the country's serious drawbacks from the beginning. The rainfall in 1903 — reported as an average year — was about 10½ inches, less than half of which came between April and October. During much of that period the ground is parched and burning. The climate is healthy and delightful, the atmospheric rarity counteracting to a great extent the heat, which at times is almost tropical. Particularly is this the case with the Santa Clara region in the southwest. Much of the soil is strongly impregnated with salt and alkali, and though toil and irrigation have done much to redeem it, many parts are still pure desert, hopelessly barren. The naturally fertile spots are mostly the alluvial, sage-covered strips


UTAH
SCALE OF MILES
Population of places is indicated by different lettering, thus:
50,000 and over SALT LAKE CITY
5,000 to 50,000 Ogden
2,000 to 5,000 Park City
500 to 2,000
Smaller Places
Railroads
State Capitals shown thus
County Seats shown thus
IDAHO
WYOMING
NEVADA
COLORADO
ARIZONA
SALT LAKE CITY
Ogden
Logan
Provo City
Park City
GREAT SALT LAKE
UTAH LAKE
SEVIER LAKE
CACHE
RICH
BOX ELDER
WEBER
MORGAN
DAVIS
SALT LAKE
SUMMIT
TOOELE
UTAH
WASATCH
UINTA
JUAB
SANPETE
CARBON
EMERY
GRAND
MILLARD
SEVIER
BEAVER
PIUTE
WAYNE
IRON
GARFIELD
SAN JUAN
KANE
WASHINGTON
UINTAH MTS.
WASATCH MTS.
PROMONTORY MTS.
GREAT SALT LAKE DESERT
CONFUSION RANGE
Colorado River
Green River
Grand River
Longitude West from Greenwich
Copyright, 1904, by The American Company

lying along the bases of the hills. The mountains are Nature's treasure vaults, and though primarily an agricultural State, with manufacture and stock-raising as strong subsidiary features, Utah has in late years forged to the fore and taken a rightful place among the great mining commonwealths of the nation.

Mining.— Utah's mining history virtually begins with the advent of the railroad, prior to which time, although mines had been discovered and opened, and a few mills and smelters erected, little headway had been made, owing to the lack of facilities for transportation. The honor of pioneering this industry is given to General Conner, the commander at Fort Douglas, who, in the latter part of 1863, prospected in Bingham cañon, and located the Jordan mine. He afterward wrote mining laws, organized with others the West Mountain Mining District, and having established a paper, the 'Union Vedette,' heralded through its columns the opening of the Utah mines. The existence of valuable ore bodies, gold, silver, lead, iron, etc., had been known to the earlier settlers, but their leaders had not encouraged mining. "We cannot eat gold and silver," said Brigham Young; "neither do we want to bring into our peaceful settlements a rough frontier population to vitiate the morals of our youth, overwhelm us by numbers, and drive us again from our hard-earned homes." For this reason he discouraged mining, advising the people to turn their attention to agriculture, stock-raising, manufacture, and kindred pursuits. Most of the Mormons followed his advice, but some joined with the non-Mormons in exploiting the mines. After his death, in August 1877, conditions having greatly changed, leading churchmen engaged in the industry. Utah's principal mines at the present day are the Ontario, Silver King and Daly-West, at Park City; the Bullion-Beck, Centennial-Eureka and Grand Central, in the Tintic District; the Horn Silver, at Frisco; and the Consolidated, at Mercur. The Daly-West and Silver King, both silver and lead mines, are the heaviest producers, the former paying $117,000, and the latter $100,000 monthly, in dividends.

Agriculture, Manufacture, etc.— Utah is fundamentally agricultural, producing vast quantities of cereals, with all varieties of fruits and vegetables common to the north temperate zone. Sheep, cattle, and horse raising is also a prominent feature of her industrial life. Among many thriving industries may be mentioned the Provo Woolen Mills, the beet-sugar factories at Lehi, Ogden, Logan and Garland, the Inland Crystal Salt Works, the Germania and Highland Boy smelters, and the electric power plants at Ogden, Salt Lake, and Provo. From the granite quarries of the Wasatch came the material for the construction of the magnificent Temple at Salt Lake City, and in the Tabernacle adjoining the Temple may be seen and heard one of the greatest choirs and one of the most perfect pipe-organs in the world. The mountains of Utah abound in game — bear, deer, elk, antelope, grouse, prairie chickens, etc.; the fresh lakes and streams are well stocked with fish in numerous varieties, and lake and river margins are the haunts of wild geese and ducks in abundance. Fish cannot live in the Salt Lake, owing to the intense salinity of its waters, which are wonderfully buoyant and invigorating. Probably the largest and most splendid bathing pavilion in existence is Saltair, on the eastern shore, within 30 minutes' ride by rail from Salt Lake City.

History.— The region of the Great Salt Lake was originally settled by emigration from the East; the vanguard a small band of pioneers led by Brigham Young (q.v.) from the Missouri River, then the frontier of the nation. This man was the leader of a religious organization, the Church of Jesus Christ of Latter-day Saints, commonly called "Mormons" (q.v.), who, expelled from Illinois in February, in 1846, had begun their exodus into the all but untrodden West. Brigham Young, the founder of Utah, like his predecessor, Joseph Smith, the founder and leader of the Latter-day Church, who had been killed by a mob in Illinois, was a native of Vermont and of Revolutionary ancestry. Leaving the main body of his followers living in tents, wagons, and log huts upon and near the Indian lands in Western Iowa, President Young conducted his pioneer company, which included 143 men, 3 women and 2 children, across the great plains and mountains, the journey beginning at Winter Quarters (now Florence, Neb.) early in April, and ending on the shores of the famous "Inland Sea," in the latter part of July 1847. This pioneer trip would have been undertaken a year earlier, but for a call made upon the migrating people by the Federal government for a battalion of 500 men, to assist in the war against Mexico; a requisition promptly filled. The pioneers were well armed and equipped, and carried with them, in wagons drawn by ox and mule teams, plows and other implements, a surveying apparatus, seed grain, a year's supply of provisions, and the usual camp accessories.

The Great West, now divided into prosperous States and Territories, teeming with populous cities and thriving villages, connected by railroads and telegraphs, was then a wilderness, an almost unknown country, not only to the people of the East, who had heard of it merely through the media of romantic tales or the imperfect reports of early explorers, but also to the straggling mountaineers who roamed over its immense solitudes, trapping the wild animals that shared with savage tribes the occupancy of the land, and consorting with these degraded beings, who subsisted in part upon the reptiles and insects infesting the barren waste. Every school boy familiar with the map of North America was acquainted to that extent with the "Great American Desert," and every reader of Congressional reports in the early "forties" had thrilled under the graphic eloquence of the great Webster, who, denouncing a proposition to establish a mail route from the Missouri frontier to the Pacific Coast, stigmatized this region as "a vast worthless area." Colonel "Jim" Bridger, living in a lonely log fort near the head waters of Green River, met President Young and the pioneers just as they had passed the Rocky Mountains, and remarked pessimistically that he would give $1,000 if he knew an ear of corn could ripen in Salt Lake Valley. Nothing daunted, the hardy empire builders pursued their way, and having penetrated to the heart of the great desert "Basin," on the wave-washed, alkaline shores of "America's Dead Sea," they laid out Salt Lake City, the parent of hundreds of

other cities, towns, and hamlets that have risen from the waste as Utah's gift to civilization.

The founders of this commonwealth were not the first settlers of the West, but to them, more than to any other people, owing to their unity, communal spirit, and systematic methods, is due the redemption of arid America. They were the Anglo-Saxon pioneers of irrigation; their settlements formed a nucleus for civilization in the inter-mountain country; and the founding of Utah made possible, or at all events greatly facilitated, the development of the whole surrounding region. As early as 1841 a thin stream of emigration had been crossing the continent, most of it going to Oregon, some to California, and all, shunning the desolate Valley by the Lake, hurrying on to the green and fertile slopes of the Pacific. Such might have been the course pursued by the Utah pioneers, had not their sagacious leader foreseen the very probable result — a repetition of the troubles that had compelled them to flee from hostile religious and political sentiment in Ohio, Missouri, and Illinois. Hence his refusal to be influenced by a prominent co-religionist, Elder Samuel Brannan, who, after piloting a ship's company of Latter-day Saints from New York around Cape Horn to the Bay of San Francisco, and leaving them to plow, sow, build, and set up a newspaper in the San Joaquin Valley, came overland to meet the pioneers, and induce them, if possible, to forego their half formed design of settling Salt Lake Valley, and instead to join the Brannan colony on the Californian coast. "No," said President Young, "this is the place." Here, accordingly, they settled, upon alien soil, in what was then the Mexican province of California, which, with another province, New Mexico, comprised the present States of California, Nevada, Utah, the Territory of Arizona, and parts of Wyoming, Colorado, and New Mexico. The acquisition of these provinces by the United States was one of the immediate results of the war with Mexico, in which the Mormon battalion took part.

The pioneers of Utah, having partly explored Salt Lake Valley, planted here their first crops, breaking their plowshares at first in the hard, sun-baked soil, afterward softened and made arable by turning upon it the waters of the mountain streams. They also constructed a log and mud fort to protect themselves from hostile Indians, prowling wolves, and other wild beasts. This done, many of them, including most of the leaders, returned to the Missouri River for their families. Those who remained in the mountains were reinforced in the fall of 1847 by several large trains of immigrants, who had followed immediately in their wake from the frontier. The aforementioned, with a small company from Mississippi, who joined the pioneers at Fort Laramie, and the returned members of the Battalion, were the colonists who struck the first blows in the building of the inter-mountain empire.

February 1848 witnessed the signing of the treaty of Guadalupe Hidalgo, by which the provinces of California and New Mexico were ceded to the United States. In March 1849 was organized at Salt Lake City the provisional government of Deseret, pending Congressional action on a petition for a State government. Congress denied this petition, but organized, with greatly reduced boundaries from those of the proposed commonwealth, the Territory of Utah, destined also to be diminished in size by the formation of subsequent States and Territories The date of the organic act was 9 Sept. 1850, but the news did not reach Utah until late in January 1851. Early in February the Territorial government was formed. One of the first counties was named Millard, and its principal town Fillmore, in honor of the nation's head, by whom Brigham Young had been appointed governor.

The first 10 years of occupancy and colonization passed in comparative peace. There were wars with the red men, in which the settlers were uniformly victorious, not more by the prowess of their volunteers than by the wise diplomacy of their leaders, whose favorite motto was, "Feed the Indians, don't fight them." The savage tribes were gradually placated, and permanent friendly relations established between white and red. There were also seasons of drought and years of famine, before irrigation prevailed over aridity, and the swarming pests of crickets and grasshoppers, which devoured the early crops, ceased their terrible visitations. The work of colonizing was vigorously pushed, settlements being formed in all parts, wherever a spring of water, bubbling up from some oasis, or the most attenuated mountain torrent held out the least hope of agricultural success. Immigration was encouraged, and systematically carried on, particularly by the "Perpetual Emigrating Fund Company," which sent annually to the frontier 500 wagons to bring the poor to Utah. Many of these immigrants, men, women, and children, walked the entire distance from the Missouri River to Salt Lake Valley, a three months' journey, pulling handcarts through frost and snow and wintry storms, in which hundreds perished. All classes of people, professionals, tradesmen, peasantry, etc., mostly Mormon converts from the States, Great Britain, Scandinavia, and other parts of the world, were to be found in these migrating trains. The newcomers, wherever possible, practised their professions or trades, but all, irrespective of former vocation, were encouraged to take up land and build homes. Small farms were the rule. There was neither land nor water for speculation.

"If the Gentiles will let us alone for 10 years, I'll ask no odds of them." Such was Brigham Young's declaration on entering Salt Lake Valley 24 July 1847; and 10 years later to the day, while he and his fellow citizens were celebrating the advent of the pioneers, came, like a thunderclap from a sunny sky, the startling news that a United States army was marching to Utah, to put down a Mormon uprising against the government. The alleged rebellion had no existence, the excitement and agitation over it being due to false reports circulated by Federal office-holders and others who had left the Territory. Pending an investigation, which he knew would prove to the government the falsity of the statements by which it had been misled, and to prevent a possible repetition of the bloody scenes of Missouri and Illinois, Brigham Young, as governor, proclaimed Utah under martial law, calling out the militia to repel the invasion. As a result the Federal army wintered east of the Wasatch mountains, and the next spring brought peace commissioners from Washington and an amicable settlement of the difficulty. Governor Al-

THE MORMON TEMPLE, SALT LAKE CITY.

fred Cumming, the non-Mormon successor to Governor Young (whose second term now closed) was welcomed to Salt Lake City, and the troops, under General A. S. Johnston, augmenting materially the limited number of "Gentiles" then in these parts, founded Camp Floyd, 40 miles southward, where they were stationed until the outbreak of the Civil War, when the post was abandoned.

An event of great importance to Utah was the coming of the Overland Telegraph Line, completed to Salt Lake City a few months after the beginning of the Civil War. The first message over the eastern wire was dated 18 Oct. 1861. It said: "Utah has not seceded, but is firm for the Constitution and laws of our once happy country, and is warmly interested in such useful enterprises as the one so far completed." This message was signed by Brigham Young, who, though no longer governor, continued to be the first citizen of the commonwealth. It was addressed to President J. H. Wade, the telegraph magnate, at Cleveland, Ohio. A similar message was sent to President Lincoln by the non-Mormon executive, Acting-Governor Frank Fuller. Subsequently there was a despatch from President Young to the chief magistrate, offering to the Nation the free service of a picked band of scouts to guard the mail route and telegraph line from Indian or other depredations during the prevailing troubles. This offer was gratefully accepted. Such was the general prejudice, however, that Colonel P. E. Conner and the California and Nevada volunteers, who had enlisted for service in the East, were assigned, much to their disappointment, to needless vedette duty in Utah, where in October 1862, they founded Fort Douglas on the foot-hills east of Salt Lake City. These troops made themselves otherwise useful by subduing hostile Indians in Southern Idaho, for which Colonel Conner was given a brigadier-generalship.

For many years the construction of a transcontinental railroad had agitated the minds of the people of the West, and the citizens, through their legislatures and their representatives and delegates in Congress, had repeatedly memorialized the government in the interest of the mighty enterprise. Utah was weary of her isolation, and now that the telegraph had done its part to annihilate time and distance, a more than ordinary yearning for the railroad was felt. The dwellers in these mountain-girt valleys were a thousand miles from civilization, and the stage-coach, succeeding the pony express, was the fastest means of conveyance over the wide and desolate plains. What wonder they should welcome the "iron horse," as they had previously welcomed the electric wire! Brigham Young himself was a large contractor on the construction of the great highway. The meeting of the Union Pacific and Central Pacific roads at Promontory, on the northern shore of the lake, 10 May 1869, was an occasion of much rejoicing. Soon the point of junction was moved to Ogden, about 40 miles north of Salt Lake City, and between these towns was built, by home capital, in 1869–70, the Utah Central railroad, the pioneer local line, Brigham Young, president. This was immediately followed by a similar line south of the capital city. These roads, with others subsequently constructed, were absorbed by the Union Pacific, which held a virtual monopoly of railroads in Utah until the advent of the Denver & Rio Grande Western in March 1883.

Utah's earliest merchants were Mormons and non-Mormons. Originally goods were freighted in ox and mule trains from Saint Louis and other eastern points, and from Southern California. During the early days of money scarcity, exchange and barter was the rule — the dry goods and groceries of the merchant for the products of farm, orchard, mill, and workshop; the latter utilized at home, or turned into cash in distant markets. The first settlers coined imported California gold dust, and also made and used paper money, until the National coins and currency became sufficiently plentiful. The greatest mercantile movement that Utah has seen was the establishment of Zion's Co-operative Mercantile Institution, organized in October 1868, to unify Mormon commercial interests in the face of the fierce competition and other changes foreseen to be imminent from the coming of the railroad. This great house still exists, though no longer exclusively a Mormon institution, and has an annual trade of over $4,000,000.

The changes anticipated were realized. Population and capital poured into Utah; the mines, hitherto unprofitable, were made productive; railroads and telegraphs were extended, manufactures established, and an impetus given to trade and industrialism in general. The pioneer journal, the *Deseret Evening News*, established in June 1850, as a weekly paper, with Willard Richards, a Mormon leader, as editor, now had two great rivals, the *Salt Lake Daily Herald* and *Salt Lake Daily Tribune*, the former independent, the latter strongly anti-Mormon. The *Tribune* was the mouthpiece of the Liberal party, between which and the People's party a long and bitter fight was waged — a period of friction between Mormon and Gentile, reminiscent of the historic feuds of Guelf and Ghibeline. Non-Mormon churches and schools also multiplied, as an offset to the dominant church and its institutions of learning; and all these, with the State University, founded in February 1850, and the old district schools, now merged in a splendid free school system established early in the "nineties," have placed Utah in advance, educationally, of most of the States of the Union.

Congressional legislation against polygamy, or the Mormon plural wife system, began in 1862, but the law remained a dead letter; Mormons with many non-Mormons believing it unconstitutional, trenching upon a principle of religion. It was declared constitutional by the Supreme Court of the United States in January 1879. In March 1882 was enacted the Edmunds law, defining polygamy (the marrying of plural wives) and unlawful cohabitation (the living with such wives) and making the offenses punishable by fine and imprisonment. Under this law, administered in great severity by the Federal courts, a crusade was instituted, and rigorously carried on wherever the Mormons had settlements. Though the number of polygamists was relatively small, being only about 3 per cent of the membership of the Church, which was less than 300,000 throughout the world, the results, owing to the prominence of the persons affected, were far-reaching, and for five years Utah was filled with sorrow and gloom. Day and night, men, women, and children were relentlessly

hunted down, haled before magistrates and grand juries, and consigned to prison. Most of the church leaders were driven into exile. A veritable reign of terror prevailed. The object was to compel the abandonment of polygamy, and the fearful pressure finally had the effect desired; not, however, before most of the Mormon church property, amounting to nearly $1,000,000, had been confiscated under the provisions of the Edmunds-Tucker law of March 1887.

With the issuance, in September 1890, by President Wilford Woodruff, then at the head of the Church, of the famous "Manifesto," doing away with polygamy, came an era of good feeling, which has continued practically to the present time. Mormons and Gentiles affiliated socially, politically and in business as never before. Local party lines were obliterated, and national politics came to the front. Presidents Harrison and Cleveland, in successive proclamations, pardoned all polygamists; the confiscated church property was returned, and everything done that a great and generous government could devise to cause the unpleasant past to be forgotten.

Under an Enabling Act, signed by President Cleveland, 16 July 1894, a constitutional convention met at Salt Lake City in the following March, and framed the fundamental law upon which Utah, on 4 January 1896, was admitted into the Union as a State. Her first elected governor was Heber M. Wells, the present incumbent, now serving a second term. He is Utah-born, a Republican, and the second Mormon among the 15 governors who have served the commonwealth. The first chief justice after statehood was Charles S. Zane, who, as a chief justice during the territorial regime, had been the local head and front of the anti-polygamy crusade. The other public offices, as in the first instance when all were Federal appointments, were equally divided between Mormons and non-Mormons. Utah's present population is about 300,000, the Mormon element still greatly predominating.

Consult: Bancroft, 'History of the Pacific States'; Tullidge, 'History of Salt Lake City'; Whitney, 'History of Utah'; Nichols, 'Mineral Resources of Utah'; Government Reports on Agriculture and Mining.

ORSON F. WHITNEY,
Historian.

Utah, a lake in the State of Utah, in Utah County, about 30 miles southeast of Great Salt Lake. It is about 25 miles long from north to south and from 3 to 13 miles wide; area, 150 square miles; altitude, 4,500 feet. It is the largest body of fresh water in the State. It is in a valley formed by the uplift of mountain ranges; on the east the Wasatch and on the west the Lake, Oquirrh and Tintic. The streams which enter the lake come mostly from the Wasatch Range. The outlet of Utah Lake is Jordan River, which flows into Great Salt Lake.

Utah, Agricultural College of, the State agricultural and mechanical college, founded in accordance with the land grant act of 1862; located at Logan, Utah. The college is a part of the public school system, and is open to both men and women. It was chartered in 1888, and opened to students in 1890; in 1901, the curriculum was considerably enlarged, and an extra year's work required for entrance to the collegiate courses leading to a degree. In 1903 the college organization was made more complete and effective by the establishment of five schools — the School of Agriculture, the School of Domestic Science and Arts, the School of Engineering and Mechanic Arts, the School of Commerce, and the School of General Science; in 1904 a Department of Music was added offering courses in vocal music, pianoforte, violin, and theory of music. The courses offered by the various schools of the college are as follows: (1) four years' courses in agriculture, domestic science, commerce, civil and mechanical engineering, and general science, leading to the degree of B.S. in agriculture, etc.; (2) three years' courses of high school grade in agriculture, domestic science, and commerce; (3), manual training courses in domestic arts (three years), and in mechanic arts (four years); (4) a college preparatory course; (5) a sub-preparatory course. The work of the last two years of the collegiate courses in agriculture, domestic science, and commerce is partially elective; the last three years of the general science course are wholly elective, except that students in the latter course are required to take two years' work in one language, and a certain amount of work in English biology, and history and civics. There are also short winter courses in agriculture (four weeks), in domestic arts (12 weeks) and mechanic arts (12 weeks). The State experiment station is connected with the college, and offers opportunity for advanced work. The students maintain an athletic association, two general literary clubs, and four special organizations open to the members of certain departments of instruction. The college buildings include the main building, mechanic arts building, the conservatory, the experiment station, the veterinary laboratory, the poultry building and four barns. The library in 1904 contained 11,500 volumes; the students number 545.

Utah, University of, the State university located at Salt Lake City. It was incorporated as the University of the State of Deseret in 1850, and opened to students in that year. But as it failed to secure patronage or adequate financial support, it was closed after one session until 1867. The governing board of regents, however, maintained their organization during this time, and had general supervision of the public school system. When first reopened in 1867 it was largely a commercial college, but in 1869 was reorganized with normal and classical departments. In 1894 a new charter was obtained, the name was changed to University of Utah, and a 60-acre tract of land on the Fort Douglas Reservation was granted to the university by the Federal Government. In the same year the Salt Lake Literary and Scientific Association gave $60,000 for the endowment of the chair of geology. In 1899 the legislature provided for the erection of new buildings and the removal of the university to the new site, which was first occupied in 1900. The board of regents consists of the president of the university, member *ex officio*, and eight members appointed by the governor for four years. The university is open to both sexes on equal terms. The organization includes the School of Arts and Sciences, the State School of Mines, the State Normal School, and the Preparatory School. The School of

Arts and Sciences offers two courses leading to the degrees of A.B. and B.S., respectively; these courses are both largely elective, the electives to be chosen from depending on the degree to be conferred. The School of Mines offers courses in mining and electrical engineering, leading to the degree of B.S. The courses in the State Normal School are: (1) Advanced Normal Course, four years, including electives in the School of Arts and Sciences, and leading to a degree and normal diploma; (2) a four years' normal course, graduates receiving the State certificate; (3) a four years' kindergarten course; (4) a five years' kindergarten-normal course. Instruction for teachers of manual training is included in the curriculum. There is a summer school, courses being provided in the usual subjects of the college curriculum and in pedagogy; work in the summer school may be counted toward a degree. The campus is situated at the base of the Wasatch Mountains, overlooking the valley, Great Salt Lake, and Salt Lake City; the buildings in 1904 include the library and administration building, the normal building, the engineering and physical science building, the museum, and the shops building. The library is the largest in the State, containing in 1904 21,500 volumes. The property and productive funds in 1904 amounted to $350,000; the students numbered 744 and the faculty 44.

U'tahlite, a name given to the nodules of compact, green variscite from near Lewiston, Utah. They have been sliced and polished, and make charming specimens. Wardite is a frequent associate. See VARISCITE.

Utakamand, oo-ta-ka-mŭnd', or **Ootacamund**, India, a southern sanitary station, the summer quarters of the Madras government, in the Nilghiri Hills, 70 miles south of Mysore. It is 7,228 feet above sea-level, in an amphitheatre surrounded by noble hills, overlooking an artificial lake. Mean temperature about 58° F. Pop. about 15,000.

Ute, ūt. See SHOSHONEAN INDIANS.

Uterus. See WOMB.

Utica, ū'tĭ-ka, N. Y., city, county-seat of Oneida County; on the Mohawk River and the Erie Canal, and on the New York Central and Hudson River main line and the leased lines, Rome, Watertown and Ogdensburg, the Black River, the Mohawk and Malone, the Adirondack and Saint Lawrence, and the West Shore, the Delaware, Lackawanna and Western, and the Ontario and Western railroads; about 95 miles west of Albany and 55 miles east of Syracuse. Electric lines extend to villages and towns 20 miles east of the city, 15 miles west, and 10 miles south. The railroads extending north cross the Adirondack region, extend to the Thousand Islands, and connect with the steamers on the Saint Lawrence and with the trunk lines of Canada. The railroads to the south connect with the Erie and some of the lines in Pennsylvania. The large number of passengers who transfer at Utica, "the gateway to the Adirondacks and the Thousand Islands," make it one of the most important stations between New York and Buffalo.

Manufacturing.— The chief manufactures are hot-air furnaces, hosiery and print goods, men's clothing, machine-shop products, steam fitting and heating apparatus, lumber products, beer, marble products, paving material, foundry products, and tobacco products. In 1900 (government census) the city had 733 manufacturing establishments, with a total capital invested of $19,289,502, and with an average number of wage-earners, 10,759, to whom was paid annually the sum of $4,148,415. The cost of material used in the manufactories was $9,405,370, and the value of the annual products was $19,550,850. Men's clothing (factory products) brought annually $2,585,927; hosiery and knit goods, $2,514,073, and steam fittings and apparatus, $1,204,693. The city is famous for the excellence of its woolen, cotton and knit goods and its hot-air furnaces.

Commerce.— The advantages which the city has for the transportation of its manufactures are great inducements to the manufacturer. Goods may be freighted on the Erie Canal or sent by means of railroads to any part of the country. The city ships large quantities of its own manufactured goods, farm products, fruit, dairy products, and live stock. It is a distributing centre for an extensive region extending north and south. Utica is an important cheese market, and large quantities of flowers, especially roses, are shipped to the larger cities.

Buildings and Municipal Improvements.— The principal public buildings are the Government building, State Armory, City Hall, Y. M. C. A. and Y. W. C. A. buildings, public library, churches, schools, and business blocks. The altitude of the city is about 505 feet, and the slope is sufficient to make a surface drainage. The sewer system is excellent. The water plant is owned by a private corporation which has a paid-up capital of $500,000. The reservoir has a daily capacity of about 4,010,000 gallons. There are a number of small squares and several parks. The streets are wide, paved, and kept clean. Utica claims to have more miles of asphalt pavement than any other city of its size in the United States.

Churches and Charities.— There are about 51 churches, divided as follows: eight Roman Catholic, seven Protestant Episcopal, seven Methodist, six Presbyterian, five Baptist, two English Lutheran, four German Lutheran, four (different denominations) Welsh, one each of Reformed, Congregational, Universalist, and Christian Science, and three Jewish synagogues. The charitable institutions are the Utica State Hospital, the Masonic Home of New York State, Saint Elizabeth's Hospital and Home, Saint Luke's Homœopathic, Faxton, and City hospitals; Home for the Homeless (for aged women), Home for Aged Men and Couples, Saint John's Orphan Asylum, Saint Joseph's Infant Home, Utica Orphan Asylum, and the City Orphan Asylum. The Woman's Christian Association and other organizations do noble work for the relief of the needy.

Education.— The educational institutions are three high schools, the public school academy, founded in 1843, the Balliol School (Utica Female Academy), the Utica Catholic Academy, 22 ward schools, a teachers' training school, several parish schools, a public free library, libraries connected with each of the three high schools, and libraries connected with some of the literary societies. Hamilton College (q.v.), at Clinton, is only nine miles distant from Utica, and is reached by steam and electric cars.

Banks.— There are eight banks and one trust and deposit company. The combined capital of six of the banks is $3,700,000; the deposits of the Savings Bank of Utica (1903) amounted to $10,101,280; the combined deposits of the four national banks, one of the private banks, and the Utica Trust and Deposit Company amounted to $10,493,460. The bank clearings, weekly average, is $2,000,000.

Government.— The government is vested in a mayor and a council of 15 members, who hold office two years. The administrative officials are appointed by the mayor, subject to the approval of the council, or are elected by the council.

History.— The original settlement was called Old Fort Schuyler, from a fort which had been erected here during the French and Indian War. It was named in honor of Col. Peter Schuyler. The territory on which Old Fort Schuyler was located formed part of a tract of 22,000 acres, granted 2 Jan. 1734 by George II., king of England, nominally to several persons, but in reality to enure to the benefit of William Cosby, colonial governor of New York and New Jersey. In 1786 a survey of the manor of Cosby, together with a map of the same, was made by John R. Bleecker. It appears therefrom that two houses were located near the fort on what is now the east side of Genesee Street, and one house on land on the west side. Improvements had been made a little farther westward, somewhere between the present lines of Broadway and State streets, and other improvements in the eastern part of the city. Outside of these evidences of civilization was a vast unbroken forest. The occupant of the house nearest the river, on the western side of the road, was John Cunningham, and his nearest neighbor, on the same side, was George Damuth. The resident on the opposite side was Jacob Christman. The settler toward the west was a man named McNamee, and the clearings on the eastern border were designated as those of McNamee and Abraham Boom. It is not known which one of these men came first. Before that time Old Fort Schuyler was an advantageous place of trade between the outlying settlements and the Indians, as there was here a fording place across the Mohawk River and the old Indian path from Oneida Castle here intercepted the path along the river side leading to the portage of Fort Stanwix (now Rome). In 1798 the village was incorporated under the name of Utica, and in 1832 was chartered as a city.

Population.— The population of Utica by the last local census, made in May 1903, was about 64,000. The last Federal census, in 1900, gave it as 56,383. The city's growth since 1900 has been remarkable. Allowing the city to have a population of 64,000, there are as many more within a radius of 20 miles, for which Utica is the commercial and industrial centre.

GEORGE E. DUNHAM,
Editor 'Utica Press.'

Utica, North Africa, an ancient city 27 miles northwest of Carthage; originally founded as a Phœnician colony in 1101 B.C. During the third Punic war Utica submitted to Rome, and became the capital of the province of Africa. Afterward it was the see of a bishop, till its destruction by the Arabs. Its ruins include an amphitheatre, an aqueduct, and the remains of quays, formerly connected with the sea, now nearly 10 miles distant, by the ancient river Bagradas, the course of which has since diverted to the east.

Utica Slate. A black more or less carbonaceous, and silicious clay slate (*Carbonaceous argillutyte*) prominently developed in the Mohawk Valley of New York State, and deriving its name from the outcrops in the vicinity of Utica, N. Y. It is also recognized in the Champlain Valley, and in the northern Appalachian region, but beyond these localities their beds are represented by more calcareous or silicious shales and arenytes. These shales rest upon the Trenton limestone and are succeeded by the more arenaceous Lorraine beds. The chief fossils of the Utica slates are the trilobite *Triarthus beckii*, and graptolites of the genus Diplograptus. See ORDOVICIAN.

Utilitarianism is a term that was first employed by John Stuart Mill in a philosophical sense, to denominate a theory of morals that had already been formulated by the Greeks, but which reached its fullest development in England during the latter part of the 18th and the beginning of the 19th centuries. Mill tells us that he adopted the word from a passing expression in Mr. Galt's 'Annals of the Parish.' His definition of the term is as follows: "The creed which accepts as the foundation of morals utility or the Greatest Happiness Principle, holds that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. By happiness is intended pleasure, and the absence of pain; by unhappiness, pain and the privation of pleasure. To give a clear idea of the moral theory, much more requires to be said: in particular, what things it includes in the ideas of pain and pleasure; and to what extent this is left an open question. But these supplementary explanations do not affect the theory of life on which this theory of morality is grounded — namely, that pleasure and freedom from pain are the only things desirable as ends; and that all desirable things (which are as numerous in the utilitarian as in any other scheme) are desirable either for the pleasure inherent in themselves, or as means to the promotion of pleasure and the prevention of pain."

Utilitarianism in England was not merely a philosophical doctrine during the first third of the 19th century. This theory of morals furnished the basis for a political and social propaganda. Of this movement Jeremy Bentham, James Mill, and his son, John Stuart Mill, were successively leaders, and its objects were distinctly radical and reformatory. The Westminster Review was founded in 1824 as the organ of the new radicalism, and proved of great influence in exposing abuses in the Constitution, in existing legislation and in the administration of justice. Bentham's most important work was in the field of legislative reform, while the Mills, father and son, who were better instructed in philosophical principles and possessed broader interests, upheld the cause of freedom and progress as well in social, economic, and religious matters. The best account of this movement, which had very important practical results, is found in Leslie Stephen's 'The English Utilitarians' (1900).

It is with utilitarianism as a theory of morals, however, that we are here most directly

concerned. The doctrine that pleasure is the end of life, which is at present usually denominated hedonism (q.v.), was first formulated by the Cyreniacs, and in a somewhat more developed form by Epicurus. In modern times this doctrine is found in Hobbes, who assumes that mankind is essentially egoistic, each individual seeking naturally what is of advantage to him. Although most of the English ethical writers of the 18th century refuse to accept the conclusions of Hobbes, they generally find difficulty in explaining why the happiness of other men should be sought by the agent, since they assume with Hobbes that it is a natural psychological principle that each seeks his own happiness. The tendency and obligation to seek "the greatest happiness of the greatest number" (an expression first employed by Cumberland) is either explained as a result of the psychological principle of association, or by taking refuge in a refined egoism through a demonstration that it pays to have regard to the happiness of others. That mankind is moved by genuinely altruistic impulses, that it is as natural to promote the good of our neighbor as to seek our own advantage, was perhaps first clearly stated by Butler in his 'Sermons on Human Nature.' Neither Bentham nor Mill, however, provides any adequate way of passing from the psychological principle, "each man naturally seeks his own pleasure," to the ethical doctrine that "the happiness of all should be sought by each individual." This latter principle, nevertheless, is that which the Utilitarians assume as the basis of their moral theory. Among the more important English Utilitarians are Cumberland, Hume, Gay, Paley, Bentham, James Mill, John Stuart Mill, and Herbert Spencer, who unites Utilitarianism with evolutionary theories.

The end of life, according to the Utilitarians, is, as we have seen, happiness. The theory thus insists that the moral quality of an act is determined by its consequences — an act being good that promotes happiness or prevents unhappiness, and wrong when it operates in the reverse direction. It is accordingly directly opposed to Intuitionism (q.v.), which declares that there is some natural quality in acts which constitutes them good or bad in themselves, and that this moral quality can be directly known without any reference to consequences. Thus an Intuitionist would say that lying is bad in itself and is directly perceived to be such, while the Utilitarian would find that its moral quality is determined by its results to the individual and to society. As we have seen, happiness means pleasure, and the avoidance of pain. The question arises whether anything more than the quantity of pleasure is to be considered in judging the morality of an action. Bentham and the older Utilitarians maintained that everything depends upon the amount of pleasure resulting from an act: "the quantity of pleasure being equal, push-pin is as good as poetry." John Stuart Mill, on the other hand, introduced the concept of qualitative differences in pleasures. "It is quite compatible with the principle of utility," he says, "to recognize the fact that some kinds of pleasure are more desirable and more valuable than others. . . . Of two pleasures if there be one to which all or almost all who have experience of both give a decided preference, irrespective of any feeling of moral obligation to prefer it, that is the more desirable pleasure. If one of the two is, by those who are completely acquainted with both, placed so far above the other that they prefer it even though knowing it to be attended with a greater amount of discontent, and would not resign it for any quantity of the other pleasure which their nature is capable of, we are justified in ascribing to the preferred enjoyment a superiority in quality, so far outweighing quantity as to render it, in comparison, of small account." This doctrine of a qualitative difference in pleasures doubtless is borne out by experience, and consequently is a practical advantage to the older Utilitarianism. But the objection has frequently been raised that to rank pleasures as higher or lower, irrespective of their quantity, is logically to abandon the utilitarian position. For it appears that it is only by introducing some other standard than pleasure itself that this gradation is possible. The Epicureans and the older Utilitarians had showed that pleasures of the mind, for example, were preferable to pleasures of the body by using the quantitative standard — that is, by showing that on account of their constancy, permanence, and the fact that they entailed no subsequent pain, they really exceeded the latter in quantity.

Bibliography.—J. Bentham, 'An Introduction to the Principles of Morals and Legislation'; J. S. Mill, 'Utilitarianism'; H. Spencer, 'Data of Ethics'; H. Sidgwick, 'Methods of Ethics'; J. Martineau, 'Types of Ethical Theory'; J. Seth, 'A Study of Ethical Principles'; L. Stephen, 'The English Utilitarians' (3 vols. 1900); E. Albee, 'A History of English Utilitarianism' (1901).

J. E. Creighton,
Professor of Philosophy, Cornell University.

Utilization of Power. See Power, Utilization of.

Uto'pia, a political romance by Sir Thomas More, written in Latin in 1615. The original title was 'De Optimo Republicæ Statu, deque Nova Insula Utopia.' It was translated by Ralph Robinson in 1551 and by Bishop Burnet in 1683. The work is the source from which have been taken many of the socialistic ideas which are to-day occupying modern thinkers. At the time it was written, the author, fearing to acknowledge these ideas as his own, attributed them to a mythical person, Raphael Hythloday, lately returned from America, whither he had gone with Amerigo Vespucci. In describing a country which he had visited, called Utopia (meaning in Greek "no place"), he calls attention to abuses then prevalent in England. Many reforms which More suggested are no longer considered Utopian, among them, entire freedom in matters of religion.

U'traquists. See Calixtines.

Utrecht, ū'trĕkt (Dutch, ü'trĕHt), Netherlands, the capital of the province of Utrecht, situated on the Old Rhine, where the Vecht branches off from it, 22 miles southeast of Amsterdam. It is a pleasant town with fine shaded promenades, and intersected with canals. The old fortifications are laid out in boulevards, but a double line of new forts surrounds the city. There are several very old churches, including the Gothic Cathedral, built in the 13th century. Other notable buildings are those of the university, recently extended, the government building, the court house, and the archives, formerly the palace of King Louis Napoleon. The university has a library of 200,000 volumes and a

botanical garden. The industrial establishments include pigment factories, saw-mills, breweries, two organ factories, a number of cigar factories, an iron foundry, etc. The town is also one of the most important railroad centres in the kingdom. Utrecht is the oldest of the Batavian cities, and was called by the Romans *Traiectum ad Rhenum*. In 1579 the act of confederation of the Dutch provinces declaring their independence of Spain was signed here, and here the peace of Utrecht was concluded in 1713 between the powers in the war of the Spanish succession. Pop. (1901) 106,800.

Utrecht, Peace of, the peace secured in 1713 through several separate treaties signed by France as one party and by Great Britain, Holland, Portugal, Prussia and Savoy on the other, later acceded to by Spain, supplemented in 1714 by the treaty of Radstadt, between Germany and France, and by the Barrier treaty of 1715, between Austria, Great Britain and the Netherlands. Its provisions terminated the war of the Spanish Succession and recognized Philip V. of Bourbon as king of Spain, he to renounce all claim to the throne of France; Savoy received Sicily from Spain; Prussia was acknowledged as a kingdom, renounced her claim to Orange and was granted Neuchâtel and a portion of Gelderland; Austria received the Spanish Netherlands, Sardinia, the Milanese and Naples; the protection of Holland was secured by possession of certain fortified towns under the Barrier treaty; and France recognized the Protestant succession in England, relinquished to her all claims to Newfoundland, Nova Scotia, Hudson Bay and Straits, and Saint Christopher, W. I., reserving fishery rights on the shores of Newfoundland, and also confirmed England in the occupation of Gibraltar and Minorca, together with the privilege of supplying African slaves to America.

Utricula'ria. See BLADDERWORT.

Uvalde, ū-văl'dē, Texas, town, county-seat of Uvalde County; on the Southern Pacific railroad; about 95 miles west by south of San Antonio. It is in an agricultural and stock-raising region, and in the vicinity are asphaltum mines. The chief industrial establishments are lumber mills, a flour mill, and a machine shop. There are seven churches, separate public schools for white and colored pupils. The two banks have a combined capital of $83,000, and the national bank has deposits amounting to $100,000. Pop. (1890) 1,265; (1900) 1,889.

Uvar'ovite, a rare and beautiful emerald-green variety of garnet (q.v.), distinguished by its containing chromium. It has a hardness of 7.5 and a specific gravity varying from 3.41 to 3.52. It is usually found in limestone or associated with chromite. Its most celebrated localities are the Ural Mountains and Orford, Quebec, where it occurs in groups of small dodecahedral crystals.

U'vula. See PALATE.

Uxbridge, ŭks'brĭj, Canada, a town of West Ontario County, Ontario, on the Black River, and on the Toronto and Northern Railway, 43 miles northeast of Toronto. It has lumber and flour mills, and manufactures iron ware, mill machinery, engines, agricultural implements, woolens, etc. Pop. (1901) 1,657.

Uxbridge, Mass., town in Worcester County; on the Blackstone River, and on the New York, New Haven and Hartford railroad, about 19 miles southeast of Worcester. Uxbridge was formerly a part of the town of Mendon; in 1727 it was separated and incorporated under its present name. In 1772 the northern part of the town was set off and incorporated as Northbridge. The town includes the villages of Calumet, Hecla, Rivulet, Scott's, Wheelock's, Uxbridge, North Uxbridge, and Uxbridge Centre. The chief industrial establishments are cotton and woolen mills, machine shops, a furniture factory, and creameries. There are five churches, a high school, 17 district schools, a free public library. The national bank has a capital of $100,000, and the national and savings banks have combined deposits amounting to $640,860. Pop. (1890) 3,408; (1900) 3,599.

Uxmal, ooz'mäl, Mexico, an ancient Maya city now in ruins, in the northwest of Yucatan, about 60 miles southwest of Merida. It has vast remains of ancient grandeur, temples, cyclopean terraces, etc., extending over a large area. The principal ruins are the 'Casa del Gobernador' and the 'Casa de las Monjas.' The temples are said to have been used by the Indians as late as the 17th century.

Uz, Syria, a historical region mentioned in the Old Testament as the scene of the story of Job, and lying to the east or southeast of Palestine, probably in Hauran, the exact position not having been identified.

Uzanne, ü-zän, **Louis Octave,** French writer on bibliography and miscellaneous subjects: b. Auxerre 14 Sept. 1852. He founded (1880) 'Le Livre,' succeeded (1890) by 'Le Livre Moderne.' In 1889 he founded the Société des Bibliophiles Contemporains. Among his works are 'The Caprices of a Book-Lover' (1877); 'Her Highness, Woman' (1884); 'Our Friends, Books: Talks on Curious Literature' (1886); 'Modern Bindings'; 'Physiology of the Quays of Paris' (1890); 'The Bachelor's Prayer-Book' (1890).

Uzziah, ŭ-zī'a, king of Judah (792–740 B.C.). He is described in the Book of Kings as being a successful warrior and wise ruler, but was stricken with leprosy because he persisted against the high priest in offering incense in the Temple. Consult Smith, 'Prophets of Israel.'