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Strabo (c. 63 B.C.—19 A.D.). Greek geographer and historian, born at Amasia. With a broad background and very widely traveled, he wrote two important works: (1) *Historical Memoirs*, in 46 books, a continuation of Polybius from 146 B.C. to the death of Caesar, lost with the exception of some fragments; (2) *Geographica*, in 17 books, nearly all preserved. It is a valuable work, partly based upon his personal experiences, and, after that of Ptolemy, is the chief authority on ancient geography. Books 3–10 are devoted to Europe, 11–16 to Asia, and 17 to Africa.

Strachey, (Giles) Lytton (1880–1932). British author. A son of Sir Richard Strachey, he was educated at Trinity College, Cambridge. In 1912 he wrote *Landmarks in French Literature*, and in 1918 *Eminent Victorians*, which attracted a good deal of attention. Strachey broke away from the conventional method of writing biography, as he did not hesitate to reveal his subjects as men and women possessing the usual frailties of mankind. His *Queen Victoria*, 1921, was on the same lines. In 1925, *Pope* appeared, *Elizabeth and Essex* in 1928, and the posthumous *Characters and Commentaries* in 1933.

Strachey, John St. Loe (1860–1927). British journalist. He edited *The Cornhill Magazine*, 1896–97, and *The Spectator* (q.v.), 1898–1925. He was a strong defender of free trade, and worked for the maintenance of good relations between England and America. His books include *The Manufacture of Paupers*, 1907; *Problems and Perils of Socialism*, 1908; and *The Adventure of Living*, 1922.

His son, (EVELYN) JOHN (ST. LOE) STRACHEY (1901–) was elected to Parliament as a Labor member in 1929, but resigned from the party in 1931. He served in the Royal Air Force in World War II, and, returning to Parliament as a Labor member in 1945, was under-secretary of state for air, 1945–46; minister of food, 1946–50; and secretary of state for war, 1950–51. His books, strongly socialistic, include *Revolution by Reason*, 1925; *The Nature of the Capitalist Crisis*, 1935; *Theory and Practice of Socialism*, 1936; and *The Economics of Progress*, 1939.

Stradivari, Antonio (c. 1644–1737). Italian violin maker. Born at Cremona, and apprenticed to Niccolò Amati, he at first modeled his instruments on those of his master, but about 1684 he adopted larger proportions, and became more independent in his methods. For a long time he seems to have experimented, but from about 1700 his instruments show that he had arrived at a definite conclusion as to the true proportions of a fine violin.

Upon the instruments of his most mature period rests his fame as indubitably the greatest of all violin makers. In the course of his long life, Stradivari made well over a thousand instruments, including violas and violoncellos, many of which are still extant, and the most celebrated of which are distinguished by particular names, such as "Le Messie," "La Pucelle," "the Dolphin," etc. They are so much valued that fancy sums are paid whenever a "Strad" comes into the market. The finest specimens possess a rich full tone, but not all his work is equally good; some of his early instruments in particular suffer from the use of inferior materials at a time when he could not afford to buy better. See Violin.

Strafford, Thomas Wentworth, 1st Earl of (1593–1641). English statesman. He sat in successive parliaments under James I, and was the most powerful of the leaders of the parliamentary opposition to Charles I and to Buckingham. In 1628 he was active in promoting the Petition of Right, but it was hardly passed when Wentworth, in July, went over to the king's side.

From the summer of 1628 onward he devoted himself to establishing the supremacy of the crown. He was created Viscount Wentworth in that year, and as president of the Council of the North he exercised an arbitrary jurisdiction over the northern counties until in July, 1633, he transferred his energies to Ireland as deputy. Governing ruthlessly, with a strong hand and a clear head, and showing neither fear nor favor except where the interests of the crown were concerned, he brought Ireland into an unprecedented state of order. At the same time he organized a military force for the crown.

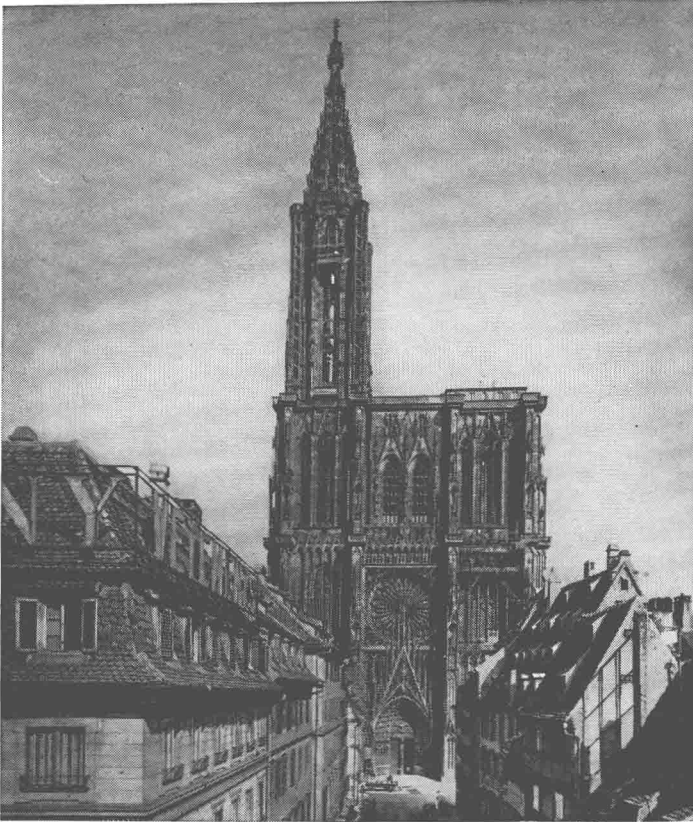
By the intrigues of the queen and a clique of courtiers Went-

worth's plans were repeatedly subverted. In 1639, he was created Earl of Strafford, and vainly imagined that he had won over the king, but again Charles allowed himself to be influenced by the court party. The Long Parliament was summoned, and its first step (November, 1640) was to move for the arrest and impeachment of Strafford for high treason. The trial began in March, 1641. It was clear that on the evidence there was no possibility of procuring a verdict against him. The Commons then adopted the unprecedented course of passing a bill of attainder, condemning the earl to death. The bill required the royal assent, and in spite of his pledged word the king signed the act of attainder, and Strafford was beheaded.

Strain and Stress. Term used in mechanics. Stress is the equal and opposite action and reaction which takes place between two bodies, or two parts of the same body, transmitting force. In the first case it is called an external stress, and in the second an internal stress. The external forces, acting on any portion of a body in equilibrium, are balanced by the internal stress. A body is altered in shape or dimensions by the stress acting on it, and is said to be in a state of strain or to be strained.

There are three principal kinds of stresses: (1) tensile, (2) compressive, (3) shear, with three resulting strains: (1) extension, (2) contraction, (3) a slide or shear. A rope being pulled is an example of a body in a state of tensile stress, a walking stick being leaned upon, of compressive stress, and a wire subjected to a simple twist, of shear stress. The intensity of stress is the stress per unit area, also called unit stress. Unit stress is the strain per unit length of the material. By Hooke's law, first enunciated in 1676, the ratio of unit stress to unit strain is a constant.

Straits Settlements. Former British crown colony. It comprised Singapore, Malacca, and Penang, all of which are adjacent to the strait of Malacca, and were the earliest British territories in the Malay Peninsula. In addition to the Cocos Islands and Christmas Island annexed to Singapore, it included



Bildarchiv Foto Marburg

Strasbourg. An outstanding Gothic monument, the cathedral has a single spire and a famous 16th-century clock.

Labuan, which came within the limits of the colony in 1907. Following World War II, Malacca and Penang became a part of the Malay Union (later Federation), Singapore was constituted as a separate colony, and Labuan became a part of the crown colony of British North Borneo. The total area of the Colony was 1356 sq. m.

Strangles. A disease of the upper respiratory tract and adjacent lymphatic glands of horses. It is prevalent where "green" horses and mules are gathered. It attacks mostly in young animals, and is sometimes called colt distemper. See Horse.

L. A. MERILLAT

Strasbourg. City in eastern France, the capital of Bas-Rhin department. It stands where the Ill joins the Breusch, about 2 m. west of the Rhine, and is about 250 m. east of Paris and 70 m. north of Basel. It consists of an old part, which still retains to some extent the appearance of a medieval city in spite of heavy damage during

World War II, and modern suburbs. It is well served by railways and canals.

The chief building is the cathedral, or minster, a fine Gothic edifice, built mainly in the 13th and 14th centuries. Notable for its lofty tower (465 ft.), it has a famous clock. The university, formerly housed in the episcopal palace, now a museum, was founded in the 16th century.

Strasbourg is important as a road and railway center and, situated as it is at the head of navigation on the Rhine, as a river port. Its manufactures include automobiles and rolling stock; there are flour, paper, tanning, and woodworking mills; distilling and food processing are other important industries. One of its most famous products is *pâté de foie gras*. A fair is held annually, and there is great trade in food products, coal and metal, wines, tobacco, etc. It was a fortress under the French and Germans.

On the site of Strasbourg the Romans had their station of Argen-

toratum. Later it became a place of importance under the Franks, the seat of a bishop, and the chief town of Lorraine. Secured by Germany in the 10th century, the city remained German until taken by France in 1681. In September, 1870, it surrendered to the Germans after a siege of seven weeks, and remained in German possession until it was returned to France in 1919 after World War I. During World War II, from 1940 to 1944, it was again held by Germany.

Strategy (Gr. *strategos*, general). Planned use of the armed strength of a nation to secure the objects of a war. It is one of the three main divisions of the conduct of war, occupying the middle position between policy and tactics. Policy, usually the function of the civil government, determines when, with whom, and for what purpose a war is to be fought; it often also stipulates the quantity of men and materials available for the war. Then comes strategy, or "war on the map," in which military leaders plan and direct operations to carry out that policy by moving available forces so as best to impose the nation's will upon the enemy. Finally, tactics (*q.v.*) involves the actual methods used in battle against the enemy.

Whereas tactical methods change from time to time with the introduction of new weapons, the general principles of strategy have remained virtually the same through the centuries. Napoleon, perhaps the greatest of all strategists, once declared, "Tactics, maneuvers, military engineering, and the science of artillery can be learned from a textbook almost like geometry, but the grand art of war can be learned only from the history of the wars and battles of the great captains, and by experience." The best training for strategy, he said, is to "read and reread the campaigns of the great masters of the art of war."

Those lessons of the master strategists have been analyzed and systematized by a few great writers on strategy, who derived from them certain principles which were likely to bring success if followed and failure if neglected. Two of those writers served as staff officers during the Napoleonic wars, Baron Jomini, a Swiss born in 1779, and von Clausewitz, a German born a year later. Their writings did more than anything else to inaugurate the scientific study of strategy. Another German, Count von Schlieffen, who drew up the major German strategy for World War I,

is generally ranked close to them. Finally, an American naval officer, Alfred Thayer Mahan, by his writings which began in 1890, became the principal analyst of sea strategy.

Out of those studies has been derived a series of "Principles of War," which embody the permanent lessons of strategy. The list sometimes varies slightly from author to author and from one official manual to another, but the principles are virtually the same, and can be applied to any campaign.

The Objective. This basic principle teaches that the proper objective should always be the principal armed force of the enemy. Once that is destroyed or nullified, everything else is easy, but until then, no other gains can be secure.

The Offensive. The commander must decide whether to attack or rest on the defensive. The answer is to attack wherever possible; victory usually goes to the attacking side. If one is temporarily too weak to attack, it is still essential to plan to assume the offensive as soon as possible.

Mass or Concentration. This teaches that, whatever one's total strength may be, it is essential to concentrate as much force as possible at the decisive spot.

Economy of Force. This principle is the corollary of Mass. In order to have maximum force at the decisive spot, it is necessary to economize elsewhere and not fritter away one's strength in minor engagements.

Movement or Mobility. This can be briefly expressed in the advice to "keep things moving," without giving the enemy a chance to build up his resistance. Sometimes this principle is interpreted to show the value of rapid movement from one place to another.

Surprise. This principle is obvious from its name. Naturally there is a real advantage in catching the enemy unawares before he can build up defenses.

Security. This principle is the obvious corollary of surprise; it involves precautions against being surprised, which include secrecy about one's own plans.

Unity of Control. This principle, sometimes given as the two separate principles of *Simplicity* and *Cooperation*, emphasizes that there should be one head with one plan, rather than a multiplicity of plans with doubt about ultimate control. It calls for full co-operation among all elements of a command.

Before the 19th century, a nation's success in war was apt to depend to a considerable degree upon its luck in having a bril-

liant and competent commander at the right time. Down through history, a few such master strategists have stood out above all others. Alexander the Great, the Greek, overran the whole known Eastern world between 334 and 323 B.C. Hannibal brilliantly led the Carthaginian forces against the Romans in the Second Punic War between 218 and 201 B.C. Julius Caesar with his Roman legions won victory after victory from Britain to Asia Minor between 55 and 44 B.C. Jenghiz Khan, the Mongol, overran much of Asia and part of Europe with his nomad cavalry between 1177 and 1227. Finally, Napoleon Bonaparte led the French to victory over most of Europe between 1796 and 1812, before he was finally overcome by the combination of British sea power and aroused nationalism.

Napoleon's very success brought on the new strategic pattern which supplanted the master strategists. The Prussians, seeking to break loose from his power about 1809, realized the risk of waiting for such a master to turn up. To avoid this risk, they developed the idea of a general staff, a group of highly trained officers who would make a scientific study of war, prepare plans in advance, and execute them in time of war. This innovation brought success to Prussia in its amazingly speedy victories over Austria and France in 1866 and 1870. Other nations copied it, recognizing that modern war had become too complex to be a one-man affair any longer. The United States Army adopted the general staff system in 1903. Early in 1942, not long after the attack on Pearl Harbor, strategic planning in the United States was placed in the hands of the Joint Chiefs of Staff, composed of the military chiefs of the ground, sea, and air forces, supported by a large group of staff planners.

In World War II the concept of "total war," as exemplified by the German subjugation of Poland in 1939, in a sense involved both strategy and international law, since it eliminated the distinction between combatants and non-combatants. It did not, however, introduce any new principles of strategy, but took full advantage of the old principles of surprise and mobility. The blitzkrieg was a tactical instrument of total war.

After World War II, the National Security Council (*q.v.*), established by the National Security Act of 1947, became an effective instrument of both policy and strategy. See Air Force; Army; Navy; Tactics; War, World, I; War, World, II.

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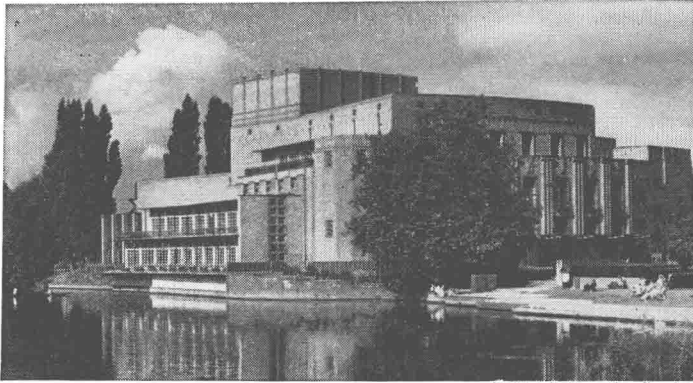
ROBERT G. ALBION

Stratemeyer, Edward (1863-1930). American author, born in Elizabeth, N.J. He was editor of *Good News*, *Young People of America*, etc., and published over 100 volumes of books for boys which achieved great popularity. He used the names Arthur M. Winfield and Captain Ralph Bonehill as pseudonyms. His best-known books were in the *Rover Boys* series, the *Flag of Freedom* series, the *Frontier* series, etc. He also wrote *The American Boys Life of William McKinley* and *The American Boys Life of Theodore Roosevelt*.

Stratford. Town in Connecticut. It lies just east of Bridgeport, on Long Island Sound at the mouth of the Housatonic River. Its manufactures include chemicals, metal products, hardware, boats, and machinery. Settled in 1639, it is a residential and resort town with many early 18th-century houses.

Stratford-on-Avon. Municipal borough and market town of Warwickshire, England. Pleasantly situated on the Avon, it is 21 m. south-southeast of Birmingham. Although an extensive trade in agricultural produce and cattle is carried on and Friday is a market day, the town's chief fame is its connection with William Shakespeare (*q.v.*), and it is one of the leading tourist shrines of Europe.

The fine cruciform parish Church of Holy Trinity, restored 1891-92, dates principally from the 14th and 15th centuries. It contains the grave and monument of Shakespeare, with a portrait bust, and the grave of his wife, Anne Hathaway. The upper floor of the old guildhall, in which strolling players performed and which was restored in 1892, was occupied by King Edward VI's grammar school, which Shakespeare may have attended; it is now national property. Before its refoundation it was connected with the Guild of the Holy Cross, the chapel of which still stands. The magnificent bridge of 14 arches which crosses the Avon was built late in the 15th century by Sir Hugh Clopton. A fine old house in the town belonged to the father-



British Information Services

Stratford-on-Avon. The Shakespeare Memorial Theater, where the festival of Shakespeare's plays is held each summer.

in-law of John Harvard (*q.v.*).

The reputed birthplace of Shakespeare in Henley Street was purchased for the nation in 1847 for £3000, and contains a museum, with the Stratford portrait, etc. New Place, in which the poet died, was destroyed in 1703, and its site was purchased by public subscription in 1878. The Shakespeare Memorial Theater was destroyed by fire in 1926, but was rebuilt with 1200 seats in 1932. One mile away, at Shottley, is the picturesque cottage where Anne Hathaway (*q.v.*) lived when he courted her.

Strathcona and Mount Royal, Donald Alexander Smith, Baron (1829–1914). Canadian statesman. Born in Scotland, he emigrated to Canada when 18 years old and became connected with the Hudson's Bay Company, becoming general manager of the company.

As special commissioner to negotiate with Louis Riel in the Red River Territory in 1869, he did much to break down the rebellion. Realizing the necessity of railway communication with the Pacific, he and his cousin, George Stephen, afterwards Baron Mount Stephen (*q.v.*), and others, formed a syndicate to build the Canadian Pacific Railway (*q.v.*).

Knighted in 1886, Smith became high commissioner for Canada in England in 1896, retaining this position until his death.

Stratosphere. Isothermal region of the upper atmosphere, above the troposphere, or lower atmosphere. The height at which it begins depends upon season, latitudes, and storm conditions, the average in middle latitudes being a little more than 6 m. above sea level. In the Northern Hemisphere in summer the under surface of the strato-

sphere rises from about 6 m. above sea level at latitude 60° to 9 m. at the equator; while the temperature changes roughly from -45°C. to -70°C. See Atmosphere.

Stratum or Bed. In geology, name given to a formation of sedimentary rocks. These rocks were deposited on the bottoms of former seas or lakes, on the surfaces of plains and deserts, etc. One stratum is separated from another by bedding planes, deposits which show an interruption in the process of formation of the stratum. Sandstones, shales, coals, and limestones are examples of stratified rocks. See Coast; Geology.

Stratus. Type of cloud so called because it has the appearance of layers or strata. Stratus clouds are usually foggy sheets of cloud floating in the sky at a low elevation, and are very common during stormy weather. When resting on the ground a stratus cloud is simply a fog. See Cloud.

Straus, Isidor (1845–1912). American merchant. Born in Rhenish Bavaria, he came to America with his family at an early age. After the Civil War he was associated with his father and brothers in business in New York, first in the firm of L. Straus and Sons, importers of glass and pottery, later in the department store firms of R. H. Macy and Co., New York, and Abraham and Straus, Brooklyn. He served in Congress, 1894–95, and was interested in reforms and educational movements. He died on the *Titanic* (*q.v.*).

Straus, Nathan (1848–1931). American merchant and philanthropist, brother of Isidor and Oscar Solomon Straus. His parents came

to America when he was a boy and settled first in Georgia, but later moved to New York where he was educated at Packard's Business College. He was a member of the firm of L. Straus and Sons, R. H. Macy and Co. (both of New York City), and Abraham and Straus (Brooklyn); but retired from business in 1914 to devote most of his time and money to charitable and welfare works.

Straus, Oscar Solomon (1850–1926). American diplomatist. Born in Otterberg, in the Palatinate, Dec. 23, 1850, he was educated at Columbia University and practiced as a lawyer in New York, 1873–81. He was minister to Turkey, 1887–89 and 1898–1901, and was appointed a member of The Hague court of arbitration in 1902. He served as U.S. secretary of commerce and labor, 1906–09, and in the latter year became the first ambassador of the United States to Turkey. Straus wrote several historical and political works.

Strauss, Richard (1864–1949). German composer. Born in Munich, son of a horn player, he was educated in music and studied also at Munich University. His *Symphony in D Minor*, 1881; a violin concerto, 1883; and his remarkable *Symphony in F Minor*, 1884, were written in the formal style of Schumann and Brahms. In 1885 he became a conductor, and came under the Wagnerian influence of Hans von Bülow and the programmatic ideas of Alexander Ritter. He later conducted in Munich, 1886–89; in Weimar, 1894–98; became General Music Director in Berlin, 1908; and led the Vienna State Opera, 1919–24.

His theatrical tone-poems: *Macbeth*, 1886 and 1890; *Don Juan*, 1888; and *Tod und Verklärung*, 1889; *Till Eulenspiegel*, 1894; *Also Sprach Zarathustra*, 1896; *Don Quixote*, 1897; *Ein Heldenleben*, 1898; and the *Sinfonia Domestica*, 1902–03, all extended with creative originality the programmatic tradition of Berlioz and Liszt. His operas, beginning with *Guntram*, 1894; *Feuersnot*, 1901; *Salome* (after Oscar Wilde), 1905; *Elektra*, 1909; the lighter *Rosenkavalier*, 1911; and *Ariadne auf Naxos*, 1912, caused sensations for their realism.

Glowingly rich in coloristic scoring, Strauss has been accused of overworking the harmonic possibilities and tonal stimulation of Wagner. Despite this, his mastery of orchestral writing and truly great melodies have assured him fame. His later operas: *Die Frau ohne*

of whose members are to perform a particular task; for example, whether glass bricks used in construction are to be handled by bricklayers or glass workers.

The *sit-down*, or *stay-in*, strike came into prominence in the 1930's. Strikers refused to leave their places of work or to allow production to proceed with other workers. Declared illegal by the Supreme Court in 1939, this type of strike was followed by the *slow-down*, in which the workers decreased production to the point where it became unprofitable to the employer.

In the *wildcat* strike, workers leave their jobs without sanction from the union. These are rare and usually of short duration. During World War II, however, in the face of "no strike" pledges by leaders of organized labor and the rising cost of living, there were a number of wildcat strikes.

A *sympathy* strike may be entered into by one union to assist another union which is striking.

Strike Activity

The principal activity associated with strikes is picketing. This consists of a patrol by one or more individuals at or near the entrance to the place of employment. The pickets may be either striking employees or their representatives. The purposes of picketing are: (1) to make known the existence of a labor dispute; (2) to persuade workers to join the strike; (3) to persuade prospective workers, including those who had gone on strike, not to accept employment there while the strike is in progress. The picket's activities may be limited merely to the carrying of placards, or it may include conversations with possible strikebreakers, name-calling, threats, or resort to physical violence.

The recorded history of strikes in the United States reveals that, generally, strike activity bears a direct relationship to business activity. Indeed, the height of business activity affects the number as well as the types and results of strikes. In times of prosperity, prices rise and so do living costs; union activity increases, unions may grow in number, and potential strikers know that the risk of striking may be minimized by ample opportunity to get other employment. As a consequence, strikes for union recognition, wage increases, and union security increase during periods of heightened business activity; for example, the marked increase in strike activity in the U.S. during 1941, which was the height of the defense boom.

PERIOD	STOPPAGES BEGINNING IN YEAR			MAN-DAYS IDLE DURING YEAR	
	<i>Workers involved</i>			Number (thousands)	Per cent of estimated working time
Number	Number (thousands)	Per cent of total employed			
1946	4985	4600	14.5	116,000	1.4
1947	3693	2170	6.5	34,600	.4
1948	3419	1960	5.5	34,100	.4
1949	3606	3030	9.0	50,500	.6
1950	4843	2410	6.9	38,800	.4
1951	4737	2220	5.5	22,900	.2
1952	5117	3540	8.8	59,100	.6
1953	5091	2400	5.6	28,300	.3
1954	3468	1530	3.7	22,600	.2

When business is depressed, prices fall and job opportunities become scarce; unions are more cautious in calling strikes and make little progress. Accordingly, the number of strikes, particularly strikes for recognition, tends to decrease; however, employer attempts to cut wages may lead to defensive strikes.

There are several other important factors which affect the number and nature of strikes. One of these is the extent to which workers are unionized. Since strikes called by nonunionized employees are rare and of short duration, the problem of strikes is essentially one of organized labor. The more rapid its extension, the greater the likelihood of strikes. New unions may find it necessary to strike to obtain recognition and, in addition, are more likely to be militant in their demands. Types of unions also have an effect on strike activity. Unions regard strikes from their individual and varied positions of strength and philosophy. Thus the strikes activity officially engaged in by a militant and radical labor organization would greatly exceed that of more conservative and long-established unions.

To these factors which are basic in the number and nature of strikes should be added both the labor relations policies of management and the presence or absence of efficient governmental machinery to avoid or settle strikes.

In all countries more strikes result from disputes over wages than from any other single cause. For example, in the U.S., since the end of World War II, wages and related issues account for about 70 p.c. of all work stoppage and about 95 p.c. of idleness.

Settlement of Strikes

There are a number of ways in which strikes may be settled: (1) by direct negotiation between the workers' representative and the management; (2) by abandonment of the strike, with strikers applying

individually for re-employment on the management's terms; (3) by intervention of a third party who may be acceptable to the parties to the dispute for the purpose of conciliation or arbitration of their differences; (4) by intervention of government, which may result in an order against either the union or management, or both; (5) by closing of the plant by the management.

The court injunction, always a controversial method of fighting a strike, was banned in 1932. The Labor Management Relations Act of 1947 (the so-called Taft-Hartley Act) restored the use of this device in certain instances.

There are two basic types of governmental contribution to the settlement or avoidance of strikes:

(1) Mediation and conciliation agencies, which offer voluntarily their services to the disputants. When their services fail to maintain or restore industrial peace, these agencies usually attempt to get the parties to agree to arbitrate the issues in dispute. Such agencies are the Federal Mediation and Conciliation Service, which concerns itself with disputes of more than local impact, and the mediation boards established by many states.

(2) Boards and commissions which are empowered to enforce the public policy as reflected in specific laws concerning labor-management relations. Thus, the National Labor Relations Board administers the Labor Management Relations Act of 1947, the stated policy of which is to encourage collective bargaining and to prevent and remedy certain interruptions to industrial peace. For example, in the case of jurisdictional strikes, which were declared illegal by the Act, the N.L.R.B. is empowered to petition the appropriate Federal court for injunctive prohibition of such strikes.

The table above, composed of official figures from the Bureau of Labor Statistics of the U.S. Department of Labor, measures strike ac-

tivity since the end of World War II. See Labor; National Labor Relations Board.

LOUIS G. SILVERBERG

Strindberg, August (1849–1912). Swedish author. Born in Stockholm, he was first an elementary teacher, later turning to journalism and the drama. His first play, *Master Olof*, 1874, was unsuccessful. He wrote his first novel, *The Red Room*, in 1879.

His early novels, bitterly satirical at the expense of Stockholm society, made him unpopular among his own people, and he was bitterly criticized for his cynical stories of married life, *Married*, 1884. He defended himself against his accusers in court and won an acquittal. His bitterness against women found fullest expression in *The Father*, 1887. Two of his best works of fiction were *The People of Hemsö* and *The Life of the Skerry Men*.

His unhappy marriages are reflected in his writing. He was placed in a mental institution for a time. From 1898 to 1908 he wrote, in addition to novels, volumes of autobiography and scientific treatises, and no less than 29 dramatic works, some historical, as *Gustavus Vasa*, and others symbolic and mystical, as *Christmas*. Consult Strindberg, F.F.U., *Marriage with Genius*, 2nd ed., 1940.

String Quartet. An intimate form of pure classical music often consisting of four movements and played by two violins, viola, and cello. This form was originated by Haydn and was developed along symphonic lines by the great masters. The standard quartet repertoire includes nearly 200 of their works. Haydn wrote 87, Mozart 30, Dittersdorf 12, and Beethoven 16, with Brahms, Schumann, Schubert, and Dvorak also contributing a few. Boccherini composed 90, which are mostly unknown today.

JAN WILLIAMS

Stritch, Samuel Alphonsus (1887–). American Roman Catholic cardinal. Born in Nashville, Tenn.; educated at St. Gregory's (Cincinnati) and North American (Rome) colleges; ordained in Rome for Nashville, 1910; pastor, chancellor, superintendent of diocesan schools; consecrated bishop of Toledo, 1921; named archbishop of Milwaukee, 1930; archbishop of Chicago, 1939; created a cardinal by Pius XII, Feb. 18, 1946. R. J. PURCELL

Stroboscope (Gr. *strobos*, a whirling, *skopein*, to view). An instru-

ment for studying periodic motion, in such a manner as to overcome certain effects which the human eye contributes to the act of seeing. The eye blurs or blends successive images into a progressive motion; the spokes of a wheel, for example, appear when moving to be a solid continuation of wood or metal. The stroboscope permits the eye to fix on a single part of the object, such as one spoke, even when the part is in motion.

The stroboscope will slow down or "freeze" any circular or vibratory motion which occurs at regular intervals. The instrument's success depends on its ability to match the speed of the object being examined. One design of stroboscope operates by means of a flashing lamp, which turns on and off rapidly in synchronism with the movement of the object, so that the object is seen only when it has reached exactly the same position in its circular or vibratory path. The eye gathers these repeated glimpses into what appears to be one image.

Another design for a stroboscope consists of a rotating disk, perforated by one or more radial slots. This disk is made to rotate at the same speed as the part to be observed, with the result that a momentary view of the object through the slot will be found to be fixed or "frozen" on a single part of the moving object, the slot and the part coming into the line of vision simultaneously and repeatedly. As the rate of rotation is varied slightly from that of the object, the apparent motion of the object will be slowed, rather than arrested.

Stroke. Popular term for sudden onset of paralysis and other symptoms due to hemorrhage in the brain. See Apoplexy.

Stromboli. Volcano of the Mediterranean Sea. It rises to 3040 ft. on the northeast of the Lipari Islands, Italy, and is frequently designated the Lighthouse of the Mediterranean. It is continuously in a mild form of activity, and in August, 1907, and June, 1921, erupted with some violence. The island has an area of 5 sq. m.

Strongbow. Name of Richard de Clare, 2nd Earl of Pembroke (d. 1176). In 1170 he went to Ireland, and, after subduing Waterford and Dublin, married Eva, daughter of the King of Leinster, succeeding to the kingdom in 1171. Strongbow allayed Henry's jealousy of his successes by surrendering his conquests to the king, but for his services in the Normandy campaign, 1173,

Wexford, Waterford, and Dublin were restored to him. Strongbow died at Dublin and was buried in the cathedral there.

Strontium. A metallic element; chemical symbol Sr; at. wt. 87.63; at. no. 38. It derives its name from Strontian, Scotland. Discovered by a Scotchman, Crawford, 1790; isolated by Davy by electrolysis, 1808. The chief minerals are celestite and strontianite. The metal is prepared by electrolysis of the fused chloride. It is a hard, silver-white metal, resembling calcium in its properties. Most of the salts are soluble in water.

The commercial minerals celestite and strontianite are usually massive and coarsely crystalline, their colors varying with the impurities. The chief commercial salts are the nitrate for the manufacture of fireworks (bright red flame), railroad flares, military flares, and rockets. The pharmaceutical trades use small amounts of the bromide, iodide, salicylate, and lactate for treatment of disease. Metallic strontium is used to prevent blow-holes in copper castings. The chloride is used as an absorbent in gas refrigerators, and the carbonate as a flux and desulphurizer in steel furnaces.

HARRY J. WOLF

Strophanthus. Genus of tropical Asiatic and African trees and shrubs of the family Apocynaceae. They have handsome flowers with a glandular calyx and tubular corolla. The seeds of several varieties are used by the natives of Africa to produce a deadly poison with which they smear the tips of their arrows. *S. kombe* and *S. hispidus* are sources of strophanthin, a heart stimulant similar to digitalis. *S. sarmentosus* has been cultivated as a source of cortisone, which is used in the treatment of arthritis.

Strophe. See Ode.

Struensee, Johann Friedrich, Count (1737–72). German adventurer and Danish statesman. He was private physician and favorite of Christian VII of Denmark, eventually becoming minister of state and virtual dictator of a country whose language he could not speak. He instituted many reforms, but was tried and executed for conspiracy against the throne.

Struma. See Scrofula.

Strunsky, Simeon (1879–1948). American author and editor. A Russian by birth, he was educated at public schools in New York and at

Columbia University. He was editor of the New York *Evening Post* and on the editorial staff of the New York *Times*. His published writings are mostly collections of essays, entertaining for their shrewd and humorous comment on current affairs. Among them are *The Patient Observer*, 1911; *Post-Impressions*, 1914; *The Rediscovery of Jones*, 1931; *No Mean City*, 1944; and *Two Came to Town*, 1947.

Strut. Engineering term for a bar or piece of material, usually of metal or wood, designed to resist pressure or compressive stress in the direction of its length. Its use is common in engineering and architecture, struts forming important parts of bridges, girders, and roofs. In aeronautics, the wings of a biplane are braced by struts.

Struther, Jan (pseudonym of Joyce Maxtone Graham) (1901–53). English author. As Joyce Anstruther she began publishing stories and poems while still a student. She served on the editorial board of the *London Times*, and in that paper published a series of sketches about the day-to-day life of a British woman and her family in wartime. These sketches, which appeared in 1940 as *Mrs. Miniver*, won great success. In 1942 they were made into a motion picture in the United States, winning an Academy Award. In 1940 Miss Struther moved to New York, achieving success as a lecturer as well as a writer.

Miss Struther's poems also are of excellent quality. Among these are *Betsinda Dances and Other Poems*, 1931; *Sycamore Square and Other Poems*, 1932; *The Glassblower and Other Poems*, 1940; *A Pocketful of Pebbles*, 1946. Other published works are *Try Anything Twice*, 1938, and *Women of Britain*, edited in 1941.

Strychnine. Alkaloid prepared from the seeds of *nux vomica* which contain strychnine, brucine, etc. The tree is a native of India, East India, Northern Australia, and China. It was discovered by Pelletier and Caventau in 1818, although it appeared in Europe during the 15th or 16th century. The tree is of moderate size, with smooth gray bark. The flowers are small and white, the fruit a round, large, yellow- or orange-colored berry. Long used for its poisonous properties, *nux vomica* was found to contain several alkaloids, principally brucine and strychnine.

Strychnine is used in medicine as a stimulant to the central nervous

system, a bitter to improve the appetite, and a circulatory and respiratory stimulant. It is a potent poison, causing violent convulsions of most of the body muscles. These convulsions begin with the slightest stimulus such as light and noise. Death from poisoning may be due to asphyxiation or exhaustion.

The most important part of treatment is to control convulsions by sedation and cut off outside stimuli. Strychnine has been used to kill insects and to trap fur-bearing animals. Its death-producing properties in humans have been observed in accidental poisonings, murders, and suicides. Because of the great agony that the victim experiences before death ensues, it is not popular as a suicidal weapon. Various chemical tests determine the presence of strychnine. Certain biologic observations are of aid. Although the symptoms of poisoning vary with the dose, individual, and perhaps the amount of food in the stomach, they appear fairly promptly when an overdose has been taken, often within minutes. Death may not occur for hours. See Drug. A. E. SMITH

Stuart. Alternative spelling of Stewart (*q.v.*), the name of the family of the later Scottish kings, and of the English monarchs beginning with James I and ending with Anne. See Mary, Queen of Scots; James I; Charles I; Charles II; James II; William III; Mary II; Anne; Charles Edward.

Stuart, Gilbert (1755–1828). American painter, famous for his portraits of George Washington. Born near Newport, R.I., he was a painter from boyhood. He had little instruction until after he was twenty, when he came under the influence of Benjamin West, in London, and studied with him for a number of years.

In London and Dublin he became a successful and famous painter of portraits of royalty and other famous persons, and was ranked by his contemporaries with Romney, Gainsborough, and Reynolds. He returned to America to fulfill his ambition to paint Washington, and maintained studios successively in New York, Philadelphia, Germantown, Washington, and Boston from 1793 to 1828. He painted forty or more portraits of Washington, including five full-length ones. The Athenaeum head in Boston is probably the most famous. Others are in leading museums throughout the country. In 1910 Stuart was chosen for the Hall of Fame at New York University.

Stuart, James Ewell Brown (1833–1864). American soldier, known as Jeb Stuart. A Virginian by birth, he was educated at West Point, resigned on the outbreak of war, and received a lieutenant colonel's commission in the Confederate forces. He took part in many of the leading battles, notably Bull Run and Chancellorsville, where he took command of the second corps after the death of Jackson.

Stubbs, William (1825–1901). British historian and prelate. Educated at Ripon Grammar School and Christ Church, Oxford, where he took a first class in classics, he was ordained and was vicar of Navestock, Essex, 1850–1866. Returning to Oxford as regius professor of modern history, he remained there until 1884, when he was made bishop of Chester. Five years later he was transferred to Oxford, where he died.

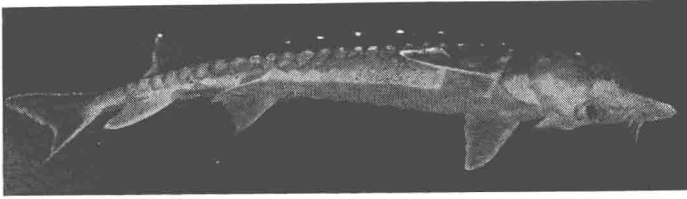
Stubbs' great book, his *Constitutional History of England*, appeared in three volumes in 1875–78. It takes the story down to 1485, and is one of the most solid of the achievements that stand to the credit of British scholarship. He also selected and edited a volume of *Select Charters*, which, like the *Constitutional History*, has passed through many editions.

Stucco. Cement or plaster used as a facing material on the outside or inside surface of walls, or for decorative purposes. The stucco used in modern buildings is usually cement stucco, made of Portland cement, sand, and usually a small amount of lime.

Stuck, Hudson (1863–1920). American Protestant Episcopal clergyman. He was born in England, came to the U.S. in his youth, and graduated from the Theological Department of the University of the South. He became Archdeacon of the Yukon, and in 1913 was one of a party of three climbers who were the first to reach the summit of Mt. McKinley, the highest peak in North America. This is described in his *Ascent of Denali*, 1914. He also wrote *Ten Thousand Miles with a Dog Sled*, 1914; and *Voyages on the Yukon and Its Tributaries*, 1917. He was a Fellow of the Royal Geographical Society.

Stupa. See India, Art and Music.

Sturgeon (*Acipenser sturio*). Large ganoid fish of the family Acipenseridae, native of both sides of the North Atlantic and the principal rivers that open on it. The



Sturgeon. Common sturgeon of the Atlantic, *Acipenser oxyrinchus*
Photo: New York Zoological Society

common sturgeon is found along the Atlantic Coast from Maine to South Carolina, it varies usually from 8 ft. to 9 ft. in length and may weigh as much as 500 lbs. The great Russian sturgeon is much larger.

The skeleton is gristly, not bony, which is partly compensated by the head being incased in hard, bony plates, and these shields are continued in five longitudinal rows along the body. The tail is heterocercal, the upper lobe being of much greater length than the lower. The snout projects far in advance of the small, toothless mouth, and between the two hang four barbules or feelers. The single dorsal fin is placed far back, only a little in advance of the tail. It is a bottom fish, and obtains its food by grubbing with its snout in the sand and mud, obtaining worms and other invertebrates. It ascends the rivers for the purpose of spawning.

About twenty species of sturgeon are known. Vast numbers are taken to be eaten fresh, smoked, or salted. The numbers taken in the U.S. are greatly depleted because of the indiscriminate slaughter of the fish as they ascend the rivers in spawning time. The roe salted, pressed, and dried forms caviar, and the air bladder is made into isinglass.

☞ **Sturgis**, RUSSELL (1836-1909). American architect and author. Born in Baltimore and educated in New York and abroad, he was a practicing architect from 1865 till 1878, when he became professor of architecture at the College of the City of New York. For the remainder of his life he wrote and lectured on art subjects. He contributed largely to periodicals and encyclopedias; and was editor and chief author of the standard *American Dictionary of Architecture and Building*, 1901-02. Among his published books are: *European Architecture, an Historical Study*; 1896; *How to Judge Architecture*, 1903; *Appreciation of Sculpture*, 1904; *Appreciation of Pictures*, 1905; and the first two volumes of an exhaustive *History of Architecture*, 1906-09.

☞ **Sturlason** OR STURLUSON, SNORRI (1178-1241). Icelandic scholar. Born

at Hvamm, Iceland, he was educated at Oddi, where he became acquainted with the poetry and traditions of the skalds. Having held the supreme magistracy in Iceland, he visited Haakon IV of Norway in 1218, but failed to execute his promise to conquer Iceland for him. After a stormy career, he was murdered at Reykholt, Sept. 23, 1241, by Haakon's orders.

His literary fame rests chiefly on his masterly prose, especially the *Heimskringla*, a history of the Norwegian kings to 1177; and his collection of the Icelandic sagas known as the *Younger Edda*. See *Edda*; Iceland.

☞ **Sturm**, JOHANNES (1507-89). German educator, born near Cologne. He founded a school in Strasbourg and developed an educational system that played a great part in the development of German teaching methods. It stressed the maintenance of strict discipline and thorough instruction in the classics, and stressed the doctrines of the Reformed Church.

☞ **Sturm und Drang**. German words signifying storm and stress,

used to denote a literary movement in Germany in the late 18th century when the nation began to rebel against French literary traditions. It represented the first outburst of Romanticism against literary and social conventions, and took its name from a novel by Friedrich Maximilian von Klinger (*q.v.*). Goethe, Schiller, and Lessing were among the leading figures in this movement. See Germany, Language, Literature, and Art of.

☞ **Stuttgart**. German city, capital of Württemberg-Baden in the zone of American occupation after World War II. It stands on the Neckar, 127 m. S.S.E. of Frankfurt-on-Main. It was made a city about 1270, and was the residence of the rulers of Württemberg from 1482 until 1918. An important publishing center, it manufactures textiles, machinery, vehicles, leather, furniture, paper, cigars, and dyes, and is an important trading center. It suffered greatly from bombing in World Wars I and II, the ducal palaces undergoing specially serious damage. Pop. 481,845.

☞ **Stuyvesant**, PETER (1592-1672). Last Dutch governor of New York. He was born in Holland, and after serving in the West Indies he became governor of Curaçao, 1635, and in 1646 director general of New Netherlands. During his term he established better relations with the Indians, and seized the Swedish colony of New Sweden in Delaware. After the surrender of New Amsterdam (New York) to the English in 1664, he was for a short time in



Peter Stuyvesant. When an English fleet demanded the surrender of New Amsterdam in 1664, the obstinate but gallant governor defied the English until it became evident the city would not support him

Holland, but returned and lived until his death on his farm called the Bouwerij (farm), which has given its name to the thoroughfare now known as the Bowery. Consult Van Loon, H. W., *The Life and Times of Pieter Stuyvesant*, 1928.

¶**Style**. In literature, mode of writing, or manner of expressing thought in language. It is generally applied to the distinctive manner peculiar to an author, or group of authors, or to a particular period or country. The French naturalist Buffon summed it up in the phrase, "the style is the man." Modern English writers regarded as stylists include Ruskin, Matthew Arnold, Walter Pater, R. L. Stevenson, and Alice Meynell. Among modern American authors distinguished for a fine prose style might be named Henry Adams, J. B. Cabell, John Burroughs, W.S. Cather, W.D. Howells, Henry James, J.G. Huneker, Agnes Repplier, George Santayana, and Edith Wharton. Consult Pater, W. H., *Appreciations, with an Essay on Style*, 1910; Quiller-Couch, A.T., *On the Art of Writing*, 1916; Lowes, J. L., *Essays in Appreciation*, 1936; Saidla, L.E.A., comp., *Essays for the Study of Structure and Style*, 1939.

¶**Style** (Lat. *stylos*, a column). Botanical term for the tip of a carpel which ends in the sticky or hairy stigma which receives the pollen grains. In some plants it is absent. See Flower; Pistil; Stigma.

¶**Style**, see FASHION.

¶**Styptics** (Gr. *styphein*, to draw together). Drugs used to stop bleeding. The more important are adrenalin, hamamelin, ergot, tannic acid, and the persalts of iron.

¶**Styria** (Ger. *Steiermark*). A state of Austria. About half the area is forest and a fifth is arable, chiefly devoted to wheat, rye, oats, and barley. Iron ore, lignite, salt, graphite, and magnesite are important minerals and give rise to the manufacture of rails, sheet iron, and wire at Donawitz and Trofaiach. Watering places are Gleichenberg and Rohitsch.

In Roman times the district, even then noted for its iron products, belonged to Pannonia and Noricum. It was overrun by the barbarians and later formed part of Carinthia. In the 11th century the German name of Steiermark came into use. In 1192 it passed to the dukes of Austria, and in 1282 to the Hapsburgs. In the breakup of the dual monarchy after World War I, Styria decreased in area from 8670 to 6323 sq. m., losing the S. portion to Yugoslavia. The capital is Graz (*q.v.*). Pop of Styria (1934) 1,016,585. See Austria. OSCAR KARBACH

¶**Styx**. In Greek mythology, river of Hades, the abode of the dead, round which it was supposed to flow seven times, or nine times according to other accounts. Its waters were poisonous. See Charon.

¶**Suakin** or **SUAKIM**. Port of the Anglo-Egyptian Sudan. It is situated partly on a coral islet in the Red Sea. Previous to the construction of Port Sudan, Suakin was a commercial center of some importance, especially for the transport of Mohammedan pilgrims for Mecca, but owing to the natural advantages of the former its value as a port has declined. Suakin was occupied by the Egyptians when their power was extended over the Sudan. In the neighborhood several battles were fought against the forces of the Mahdi.

¶**Subahdar**. Native commissioned officer in the Indian army next above the jemadar. A subahdar major is the confidential native officer of a regimental commander, and is expected to ascertain and report upon anything that goes on among the sepoy and other native soldiers, which is of a character to impair the general good feeling or interests of the corps.

¶**Subaltern** (Lat. *sub. under; alternus, alternate*). A person holding a subordinate position; in military usage, a commissioned officer below the rank of captain, *e.g.*, lieutenants and second lieutenants.

¶**Subconsciousness**. This term is most widely used today in the psychoanalytic sense, namely, as that part of the mind or psyche of which the person is not directly aware—commonly called the unconscious. It varies in depth, so to speak, the part nearest to the level of consciousness being called the fore- or pre-conscious. The deeper layers of the unconscious are said to contain not only the experiences of one's personal past, but also patterns of the racial past; it is also the fountainhead (conceived as the *Id* by Freud) of the instincts. It is at least very active in the life of human beings and much of our conduct and feelings emanate from it.

L. E. HINSIE

¶**Subdominant**. Fourth degree of a major or a minor scale, *e.g.* F in the key of C, so called because it lies the same distance below the keynote as does the dominant above it.

¶**Subiaco** (anc. *Sublaqueum*). City of Italy, in the province of Rome. Walls and terraces of one of the villas of Nero are still to be seen on the opposite side of the valley from the three monasteries. Here in 1465 was printed the first book published in Italy. Pop. 8200. See Benedict, S.

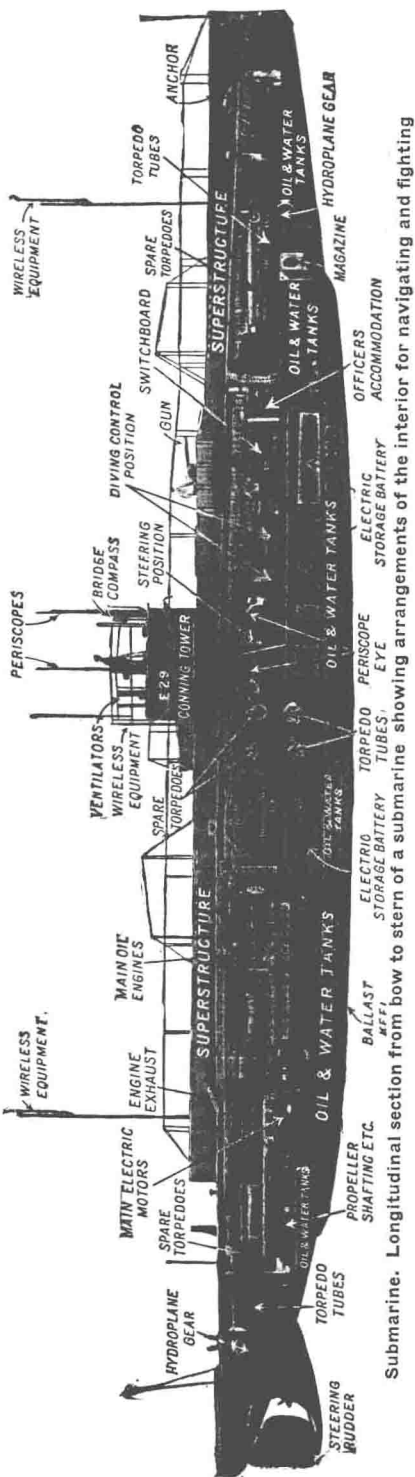
¶**Subject** (Lat. *subjectos*, put under). Philosophical term used in three different senses, as opposed to attribute (predicate), quality, and object. As opposed to attribute, it stands for that of which the attribute is affirmed. The subject is the more important of the two ideas which every judgment necessarily contains. In metaphysics, as opposed to quality, subject is often used as a synonym for substance. In this sense, it is a being regarded as integral and permanent, representing the union in space and time of its manifold and shifting phenomena.

Since the time of Kant, however, subject is more commonly opposed to object. In this sense it is used for the Ego, the thinking subject, the soul which thinks. The subject is the mind that thinks; the object is that about which it thinks. A subjective impression has its origin in the mind itself; an objective impression is due to the observation of external things. Subjective refers to the immediate appearance or impression, objective to that which we recognize from that appearance as appearing in it. In other words, subjective refers to the appearance as such, or to the appearance in its immediate relation to the Ego or thinking subject to which it appears; objective to the knowledge of the appearance or object.

It should be noted that the schoolmen used the terms subjective and objective in an exactly opposite sense. To them subjective meant that which was real, that which belonged to things as they were in themselves; objective that which was ideal, that which belonged to things according to the manner of their presentation to consciousness.

¶**Subject**. In music, a theme or sentence upon which a composition is founded. A fugue subject is generally concise. The subjects in a sonata (*q.v.*) are of greater length, and may comprise more than one sentence, and include several distinct ideas. The earliest form of subject was the Cantus Firmus which, put into long notes, formed the thread upon which the composer wove his various devices of imitation. Sometimes this might be a plain song theme, but not infrequently secular melodies were used.

¶**Subjunctive** (Lat. *subjunctivus*, joining on at the end). In grammar, the mood of contingency or uncertainty, preceded by a conjunction expressed or understood: were he alive; if it be. In most languages it plays an important part; in English almost the only survivals are *be* and *were*, and it seems



Submarine. Longitudinal section from bow to stern of a submarine showing arrangements of the interior for navigating and fighting

likely that even these will eventually disappear.

Sublimation (Lat. *sublimare*, to raise). The passing of a solid substance into vapor without melting. The vapor is similarly condensed by cold direct to the solid state. Sublimation is conducted in vessels made of iron, glass, or earthenware, and the process is employed for purifying various chemicals such as iodine, sulphur, naphthalene, ammonium chloride (sal ammoniac), and camphor. Flowers of sulphur is a sublimation product. Camphor is refined into glass flasks, termed bomboloes, in the upper part of which the camphor sublimes.

Subliminal Self (Lat. *sub*, below; *limen*, threshold). In psychology, a term for the subconscious mind, employed especially by those who regard it as the fundamental self, of much wider scope than the empirical self of normal waking consciousness. This school, following F. W. H. Myers and W. James, holds that in the evolutionary process only so much has emerged as the practical ends of physical life require, the rest of the personality, unknown to the empirical self, remaining in contact with other minds, drawing energy from a spiritual reservoir transcending individuality, and in certain exceptional persons overflowing and manifesting itself in the hypnotic trance, telepathy, clairvoyance, inspiration, and the intuitions of genius. See Hypnotism; Psychical Research.

Submarine Mines, see MINE LAYING; MINE SWEEPING.

Submarines and Submarine Warfare. The submarine is a vessel which keeps to the surface of the sea normally, but is built to operate below the surface when required. As a craft designed for fighting, it submerges with the object of securing invulnerability, if possible. In that position it makes surface observations through its periscope, and its weapon

is the torpedo. In the newer boats the number of torpedo tubes is normally six, although some of the larger vessels have as many as ten. For surface operations, all modern submarines have one or more guns of 5-in. or 6-in. caliber, mounted for horizontal and antiaircraft fire. In some submarines, notably the giant French craft *Surcouf*, surface armament reaches much greater proportions. The *Surcouf*, before her destruction in 1942, carried 2 8-in. guns, 2 37-mm. guns, and 4 antiaircraft machine guns. Deck guns aboard other large submarines reach 5.5 and 6 ins. in caliber. These weapons can be drawn within the hull before submersion, or their bores can be made completely watertight. Some larger submarines supplement their armament with scouting seaplanes housed in hangar compartments in the boat's superstructure.

There are several forms of hull. Generally the section is circular, with side tanks, giving the submarine a boat-like shape. Submersion from surface cruising or awash trim is accomplished by admitting water into the ballast and trimming tanks, thus destroying its buoyancy, though a reserve of buoyancy is always retained to prevent the submarine from going to the bottom. Rapid submersion is assisted by hydroplanes or horizontal rudders. When it is desired to rise, the tanks are emptied by the use of compressed air or by pumping. High and low pressure compressors charge numerous "air-bottles," fitted in many parts of the submarine, up to a pressure of 2500 lbs. per sq. in. In this way air is provided for blowing out the ballast tanks and bilges.

Diesel or other heavy oil engines drive the submarine on the surface up to a speed of 20 knots (22.25 knots in the British submarines *Clyde* and *Severn*), and while cruising on the surface, accumulators are charged for submerged propulsion by electric motors at a speed which may exceed 10 knots.

It is impossible to describe all the complex machinery of submarines. By means of powerful oil or steam engines and electric motors, air compressors, horizontal and vertical rudders, and instruments in the conning station under the complete control, the boats are under complete control. As illustrating the range of modern submarines, it may be noted that two went out from England to Australia under their own power and that one of them had 30,000 m. to its credit before it had to be refitted. Through the use of auxiliary surface mother

ships to supply fuel and repairs (there have been reports of German "mother subs" operated for the same purpose), their range can be practically unlimited.

The periscope (*q.v.*) is the eye of the submarine when it is under water. When completely submerged it can navigate only by the compass. The larger boats carry two periscopes. The periscope rises from a point in the submerged conning position, through the deck to a position above the surface. Great strength is given to the apparatus, and the tube is raised and lowered with great rapidity. The top of the periscope revolves in order to sweep the whole horizon, and there are periscopes which, by the use of an annular lens, give a view of the whole circle, on a small scale, surrounding the particular object under observation. Some periscopes are equipped with a saddlelike arrangement by which the commander may "ride" with the periscope, thus facilitating and speeding observation. Many subs are now equipped with camera attachments to the periscope, so that the results of attack may be pictorially recorded without coming to the surface.

Air is supplied from cylinders, and the conditions of respiration are usually good, or at least tolerable. Drinking water is carried in large quantities, but sea water is admitted for the cooling of the engines. With increasing size the submarine approaches the surface classes of small warships.

Looking at the submarine from the days of the Dutchman, Cornelis van Drebbel, who had a wooden subsurface boat in 1624, through the American attempts of David Bushnell in 1775 and Robert Fulton a few years later, of the underwater vessels of the American Civil War, with the advance of Thorsten Nordenfeldt, John P. Holland (*q.v.*), Simon Lake, and others, up to the submarines of modern times, it is seen that this class of warship has made probably as great an advance as any other.

World War I gave the submarine a definite place in the category of warships, and indicated plainly what its duties must be. There had been, for a time, a disposition to regard the underwater craft as the weapon of a weaker power, but the British naval policy of recent years, initiated by Lord Fisher of Kilverstone (*q.v.*) in 1901, when five Holland (American) boats were ordered, was to range it in the armory of the stronger. Admiral Jean Jurien de la Gravière, in France, and Sir Percy M. Scott, in England, arrived at the conclusion that the

submarine would ring the knell of the battleship.

Nothing of the kind happened. Although early in World War I the antiquated German submarine U9 succeeded in sinking three British cruisers in one afternoon, experience in combating the submarine menace soon showed its vulnerability. Today, the submarine is vulnerable to the effects of depth charges, barrages, explosive nets, explosive paravane charges, supersonic listening apparatus, and other devices. If it can be forced to the surface, it is particularly vulnerable to ramming, shellfire, or attack from the air. In regions removed from the range of enemy bombers, blimps have proved invaluable in tracking enemy submarines by their shadow or oil slicks, and then destroying them by hovering and releasing depth charges. Today, submarines sometimes lie in ambush in "wolfpacks," aided by a spotting seaplane or a decoy submarine. In night attacks, they will sometimes rise to the surface in the midst of a convoy before firing their torpedoes. However, they are often defeated by the system of convoy adopted.

During World War I, the submarine was given an entirely new function from that hitherto accepted. It had been understood by all belligerents that the submarine was a warship legally employed only when operating against other warships. However, during the four years of war, the submarine became Germany's chief weapon in their attempt to break Allied supply lines by the sinking of merchant vessels without warning. To meet this threat, merchant ships were armed, but as the submarine and its armament grew stronger, it was found that convoying in large groups with warship protection offered the only feasible answer.

The smaller classes of submarines are best adapted for local defense in guarding coasts, estuaries, and the approaches to ports, although many of them have a range which makes widespread raids on enemy shipping possible. The Japanese developed a two-man "suicide sub." These vessels were built to be carried by a mother ship or large submarine within 100 m. of an enemy port, there to be launched to bypass harbor defenses and sink the shipping lying at anchor within. While ingenious in design, their record at Pearl Harbor on December 7, 1941, and later at Sydney, Australia, proved that they were ineffective.

The main functions of the submarine of World War II were in

order of importance: raiding enemy commerce, minelaying, and operations with the fleet. Inventions such as an underwater, high-explosive tool which is capable of driving a steel stud $3\frac{1}{2}$ ins. by $\frac{1}{2}$ in. through a $\frac{1}{2}$ in. steel plate, underwater cutting devices, improved escape chambers and diving bells, marker buoys, and artificial lungs to enable trapped crew members to reach the surface, all made their contributions towards the safety of the submarine.

In the later boats, in view of their exacting duties, additional accommodation and protection was provided for the commander and the quartermaster in the form of a deckhouse built over and around the conning tower. Far from the comparatively experimental craft of 1914, the submarine of the second World War represented a submersible destroyer, capable in some cases of dealing effectively on the surface with units sent to destroy it. As the war demonstrated, the submarine is still one of the most deadly weapons of war. See Destroyer; Diving (with illus.); Eagle (warship); Mine Laying.

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¶**Submediant.** Sixth degree of a major or a minor scale, *e.g.* A in the key of C, so-called because it is the middle note between the subdominant (*q.v.*) and the tonic, just as the mediant is the middle note between the tonic and the dominant.

¶**Subornation** (Lat. *sub*, under; *ornare*, to provide). Crime of procuring another person to commit an illegal act. As a legal term it is virtually restricted to subornation of perjury—instructing or inducing another to give false evidence on oath; an offense involving the same punishment as perjury itself.

¶**Subpoena** (Lat., under a penalty). Writ issued out of a court of justice commanding the person to whom it is addressed to present himself in court at such a time, under a penalty if he fails to comply. It is only used now as a means of compelling the attendance of witnesses, and such a subpoena is called *subpoena ad testificandum*. A *subpoena duces tecum* is a writ ordering a witness to bring to court documents or other things in his possession. Disobedience to a *subpoena* is generally punished by a fine.

¶**Subsidence.** Term used in geology for the sinking of portions of the earth's crust. Such movements take place from a number of causes, e.g. erosion and weathering of rock masses, which slowly bring ino play, due to unequal distribution of land, forces great enough to bring about a warping of the earth's crust. Such subsidences are constantly taking place on a large or small scale. The land is slowly subsiding on the W. coast of Greenland, on the Italian coast near Naples, on the E. coast of N. America, etc. See Erosion; Geology; Rift Valley; Rock.

R. W. B.

¶**Subsidy** (Lat. *subsidiūm*, aid). Term used in state finance for various kinds of money grants. In English constitutional law subsidies were grants voted by parliament to the king, supplementary to the ordinary revenues of the crown. Until the reign of Edward III the voting of subsidies was the chief business of parliament. At first they chiefly took the form of additional duties levied on the wool, leather, cloth, and wine imported and exported by aliens.

In another sense, a subsidy is a grant paid annually, or as need arises, by one state to another which it desires to support, especially in war, or to bind to its own interests. Thus Elizabeth subsidized the United Provinces of the Netherlands in their struggle with Spain. In modern times, Afghanistan has received regular subsidies from Great Britain to secure her neutrality.

Subsidies, also known as bounties, are also sometimes paid to private concerns which it is thought in the public interest to encourage. See Bounty; Ship Subsidies; Taxation.

¶**Substance** (Lat. *sub*, under; *stare*, to stand). In philosophy,

that which has a permanent, independent existence contrasted with its accidents (unessential qualities), which are variable, and have no independent existence. Substance, then, will mean that which supports the accidents, makes their existence possible; in reference to its permanent existence, the word is sometimes derived from *subsistere* (to subsist). The chief views of substance are: (1) Since nothing is permanent, the idea of substance is a pure fiction. (2) There is an absolute, infinite substance, of which all beings are only "modes" (Spinoza). (3) There are no sensible substances, the world is known to us only by the action of God on our mind. Substance is not a separate thing over and above phenomena, but a simple form of thought applied to the matter of knowledge, the reality of which, however, we cannot affirm, since such an affirmation would transcend the limits of experience. The category of substance only expresses the necessary connection of phenomena in space and time; beyond the phenomenon, substance is a purely unknown quantity (Kant). (4) Substances are only permanent bundles of impressions (Hume, Mill).

¶**Substitutions.** In mathematics, the theory of the replacement of a set of algebraic variables by another set connected with the first by a system of equations equal in number to that of the variables in either set. The theory, which belongs to the domain of higher mathematics, has many important applications, especially in projective geometry and methods of analytical treatment of curves and surfaces. By means of the theory it was shown that the quintic or equation of the fifth degree could not in general be solved.

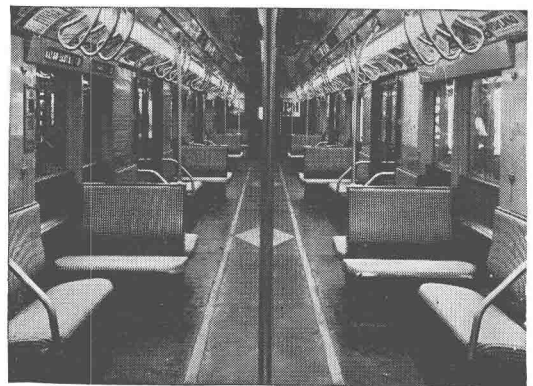
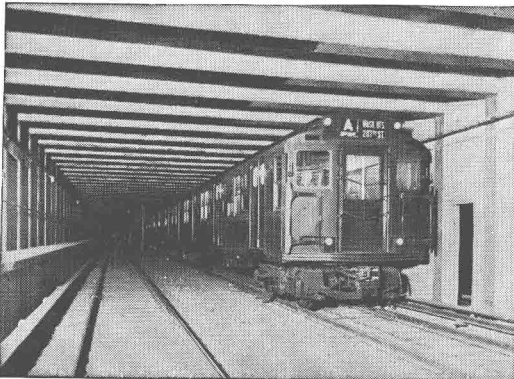
¶**Subways.** Tunnels running be-

neath the streets of a city in which rapid transit for freight or passengers is offered on electric trains. London was the first city to adopt this form of transportation and built two lines about 1870. These were, of course, operated by steam at first and were then most uncomfortable for the passengers. The first subway in the U.S. was constructed in Boston and was run by electricity. Construction on the first N.Y. subway began in 1900 and the trains began running Oct. 27, 1904. Some of New York's subways are municipally owned. Although other American cities have planned subways, Chicago and Philadelphia are the only ones that have completed them as yet. New York has the largest subway system in the world and carries approximately 6,500,000 passengers daily. It was constructed at a cost of from \$2,000,000 to \$10,000,000 per m. and has more than 400 track m. Two of the four tracks are for express trains; the other two for local trains.

¶**Succinic Acid** (Lat. *succinum*, amber), $\text{CH}_3\text{CH}(\text{CO}_2\text{H})_2$. Solid acid, usually prepared by the dry distillation of amber. Amber is subjected to dry distillation in a retort, when it is decomposed into amber oil (spirit of amber), amber resin, and succinic acid. The last named is a yellow-colored crystalline substance. The salts of succinic acid are known as succinates, and are employed in medicine. See Amber.

¶**Succubi.** Term used in demonology for female demons who were supposed to hold intercourse with men in their sleep.

¶**Succulent Plants** (Lat. *sucus*, juice). Plants whose leaves and shoots, sometimes the entire plant, are swollen owing to their tissues storing up great quantities of fluid. Such a condition denotes that the natural habitat of the plant is



Subway. Exterior and interior of trains on New York's city-owned Independent Line
Photos: New York City Board of Transportation

either the desert, dry rocks, or the seashore. In the desert, where rain falls only at long intervals, perennial plants could not survive if they had no means of storing moisture, which they absorb in quantity during the rainy period. Their cuticles are leathery, and permit little evaporation. Examples are afforded by cacti, some of the euphorbias, agaves, and aloes. Rock plants such as sedums and sempervivums are subject to similar conditions, because their roots have little soil, and this rapidly dries up.

☞ **Suchau**, **SOOSHOW**, OR **SUCHOW**. City in the south of Kiangsu province in China, on the Grand Canal east of Lake Tai. It lies 50 m. west of Shanghai, with which it is connected by railroad. An important rail junction, its chief industries are silk and cotton milling, and it carries on an extensive trade in rice. It is also an educational center. It was opened to foreign trade in 1896. It is a walled town with extensive suburbs and contains numerous temples, the most famous of which is the Great Pagoda. Known as Wuhsien from 1912 to 1949, it was held by Japan, 1937-45, and fell to the Chinese Communists in 1949. It has a population of about 380,000.

☞ **Sucker**. Fresh water fish of the family Catostomidae, related to the catfish. Characterized by thick, fleshy lips and a sleepy disposition it is despised by fishermen. Of the 60 or more known species all but two Siberian groups are native to North America. Their flesh is soft and tasteless, they are a dull mud color and obtain their food by sucking up soft organisms and matter from the bottom of mill ponds, rivers, lakes and bayous.

☞ **Sucking Fish** OR **REMORA**. Name popularly applied to several groups of fishes distinguished by the presence of a disk on the upper part of the head, or on the breast, which acts as a sucker and enables the animal to attach itself to any object. They attach themselves to moving objects, such as ships, sharks, and turtles, as well as stones. The back of the remora is light colored and the underside dark—a provision for concealment when attached by the back of the head to a dark object.

☞ **Suckling**, **SIR JOHN** (1609-42). English poet. He was admitted to Gray's Inn, and after inheriting large estates traveled in France and Italy, and served under Gustavus Adolphus. Knighted in 1630, he became conspicuous at court for his wit, prodigality, and addiction to gaming. He raised a troop of horse to aid Charles I against the Scots,

and was M.P. for Bramber. Implicated in a Royalist army plot, he escaped to Paris, where he is said to have committed suicide. He wrote a few plays, some happy descriptions of his contemporaries in *The Session of the Poets*, 1637, and a book on Socinianism, but is best remembered for such lyrics as "Why so pale and wan, fond lover?" He is believed to have been the inventor of cribbage.

☞ **Sucre**. Official capital of the republic of Bolivia, formerly called Chuquisaca. It is situated at an altitude of 9300 ft. on a plateau of the Eastern Cordillera of the Andes. The main buildings are the cathedral (1553), the president's palace, and the university, which, founded in 1624, yields only to the one at Lima, the honor of being the oldest university in the western hemisphere. Agriculture is the principal industry and mining is also carried on. Founded by Spaniards in 1536, it was named Ciudad de la Plata, from the rich silver mines in the

direct pressure. It does not indicate any particular kind or quality of gas, but only the manner in which it is produced and used.

During the development of the special furnaces or producers and of the gas engine itself, the idea of allowing the gas engine to draw its supply of gas from the producer, that is to say, to suck the gas into its cylinder as required, was evolved. Gas so provided became known as suction gas, as distinguished from gas supplied under pressure. See Gas; Producer Gas.

☞ **Sudan** OR **SOUDAN**, THE (Arabic *Beled-es-Sudan*, land of the blacks). Loose geographical term for a region of North Africa lying between Egypt and the Sahara on the north and the central equatorial regions on the south, and stretching from the Atlantic to the Red Sea and the highlands of Abyssinia. The Sudan is divided into three portions—the Western Sudan, containing the basins of the rivers draining into the Atlantic; the Central Su-



Ewing Galloway

Sudan. Natives in a thatched village in Anglo-Egyptian Sudan

neighborhood. Here Bolivian independence was proclaimed in 1825, and the city took its modern name from the first president of the republic. Pop. about 40,000.

☞ **Sucre**, **ANTONIO JOSÉ** (1793-1830). Venezuelan soldier. He served under Bolívar in the war of independence, being largely responsible for the victory at Pichincha, which freed Ecuador, and that of Ayacucho, which freed Peru, from Spain. In 1826 he was chosen life president of the new republic of Bolivia, but resigned in 1828 and, returning to a military career, led the Colombians to victory over the Peruvians at Giron, Feb. 26, 1829. He was murdered by a group of assassins on June 4, 1830.

☞ **Suction Gas**. Term used for gas used in suction as distinct from

dan, containing the rivers draining into Lake Chad; and the Anglo-Egyptian Sudan. Most of Western and Central Sudan consists of French territory.

The Anglo-Egyptian Sudan extends south from the frontier of Egypt to Uganda and the Belgian Congo, a distance of about 1650 m., and west from the Red Sea to the confines of Wadai. It is bounded west by the French possessions, south by the Belgian and British territory, and east by Abyssinia and Eritrea. The area of 967,500 sq. m. is divided into 9 provinces. There is a population of more than 8,000,000. With the overthrow of the Khalifa, Sept. 2, 1898, a stable system of government was introduced and, under a convention between the British and Egyptian

governments, signed at Cairo, Jan. 19, 1899, provisions were made for a joint administration. Beginning in 1924 the nationalist party in Egypt agitated for control of the Sudan as part of its policy of a free and independent Egypt, but Sudan's status as a condominium was reaffirmed in the Anglo-Egyptian treaty of 1936. The territory is administered by a governor general appointed by Egypt with the assent of Great Britain. In 1948 a legislative assembly was established by the governor general in council, to consist of 10 nominated and 65 elected members, and an executive council at least half of which must be Sudanese.

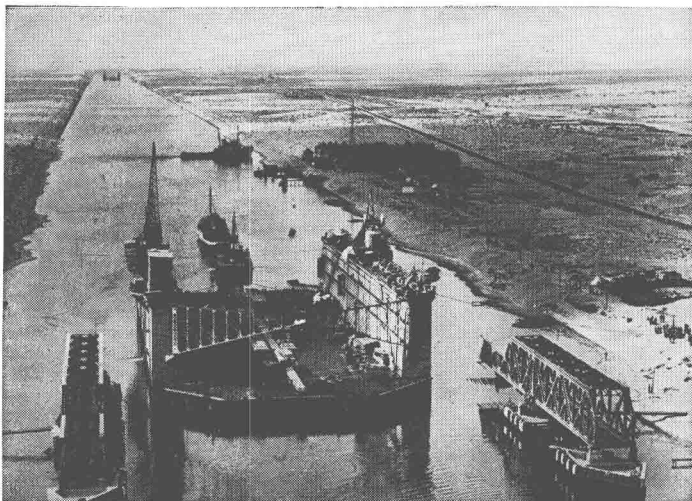
Much of the land is extremely fertile. Gum arabic, cotton, salt, grains, and timber are among the chief exports.

☪ **Sudbury**. City in Sudbury District, Ontario, Canada, 81 m. west of North Bay and 192 m. east of Sault Ste. Marie. Served by the Canadian National and Canadian Pacific rlys., it is the center of the nickel industry, producing about 90 p.c. of the world's nickel, with mines, smelters, and refining works. Copper, gold, and other metals are also produced in quantity. Other industries include lumber, wood pulp, paper, and bricks. In a cosmopolitan area, two of its newspapers are published in Finnish. The Technical and Mining Institute has a high reputation. Pop. (est.) 47,054.

R. D. HILTON SMITH

☪ **Sudermann, HERMANN**, (1857-1928). German dramatist and novelist. Success and fame came with his first play, *Die Ehre* (Honor), 1888, which was followed the same year by a brilliant novel, *Frau Sorge* (Dame Care). From 1890 onward he produced a succession of noteworthy plays and novels, often satirical and always powerful. Among them are *Heimat* (translated as *Magda*), 1893; *Johannes*, 1898; *Es Lebe das Leben* (The Joy of Living), 1902; *Das Hohe Lied* (The Song of Songs), 1908.

☪ **Sue, MARIE JOSEPH EUGÈNE** (1804-57). French novelist. Born in Paris, he served as a military and naval surgeon, seeing service in Spain in 1823, and at Navarino, 1828. He came into literary prominence as a writer for *Émile de Gérardin's* paper, *La Presse*. In 1842 his best known work, *Les Mystères de Paris* (The Mysteries of Paris), depicting vice and low life and indicting civilization as an agency for driving the innocent into crime and immorality, appeared in the *Journal des Débats*. Its successor, *Le Juif errant* (The Wandering Jew), 1845, was an attack on the



Suez Canal. A floating dock, built in India and bound for Malta, after being cut in two is towed through the El Firdan Swing Bridge

Photo: British Information Services

Jesuits, and *Les Mystères du Peuple*, 1849, was condemned as seditious. He became a political exile in 1851.

☪ **Suetonius** (70-140). Roman writer, whose full name was Gaius Suetonius Tranquillus. He was private secretary to the emperor Hadrian, and in this capacity was able to accumulate the material for his *Lives of the Twelve Caesars*, published in A.D. 120, the only one of his voluminous writings which has survived otherwise than in fragments. These biographies do not rank high as literature, but are a mine of information about the lives of the early emperors.

☪ **Suez**. Town of Egypt. It is situated at the south end of the Suez Canal and on the Gulf of Suez. In the neighborhood are the Wells of Moses, on the east side of the gulf. Railroads connect the town with Cairo, Port Said, and Port Ibrahim at the southern entrance to the Canal. Pop. 108,250.

☪ **Suez Canal**. Ship canal between the Mediterranean and the Red Sea. The inception of the modern scheme dates from Napoleon's expedition to Egypt in 1798, but the first concession for the construction of the canal was given by Said Pasha, viceroy of Egypt, to Ferdinand de Lesseps, Nov. 30, 1854.

The company was duly launched, the capital being \$40,000,000 in 400,000 shares of \$100 each, but the shares were not well taken up, particularly in England, where the scheme had all along been opposed both on political and technical grounds, and the issue was only saved from failure by Said Pasha

himself agreeing to take up the balance of 177,642 shares.

Work was commenced on April 25, 1859, and, in spite of great difficulties, it went on steadily till Said's death in 1863. Before many months his successor, Ismail, found himself involved in disputes with the company as to the supply of labor, and the withdrawal of various rights or privileges conferred on the company by his predecessor. Finally, he agreed to refer all outstanding questions between him and the company to the emperor Napoleon III. The result was that the government of Egypt was, in July, 1864, condemned to pay, under various heads, a total sum of \$16,800,000. The canal was opened on Nov. 17, 1869. The total expenditure of the company is said to have been about \$85,000,000, but the result of the first year's working was very unsatisfactory. A new loan was urgently required. In 1875 Ismail Pasha sold his shares to the British government and in 1876 three British directors joined the board that administered the canal.

In 1883 a proposal was made for duplicating the canal, but the scheme fell through, and was replaced by an alternative plan for the deepening and widening of the original channel. This was duly carried through at a cost which required the raising of a new loan.

During World War I the administration of the canal was in charge of the British military authorities, and, guarded by the British and French armies and navies so as to keep the passage-way open for the Allied troops, the